The Chemical Age 5 January 1952

WITH METALLURGICAL SECTION

The Chemical Age

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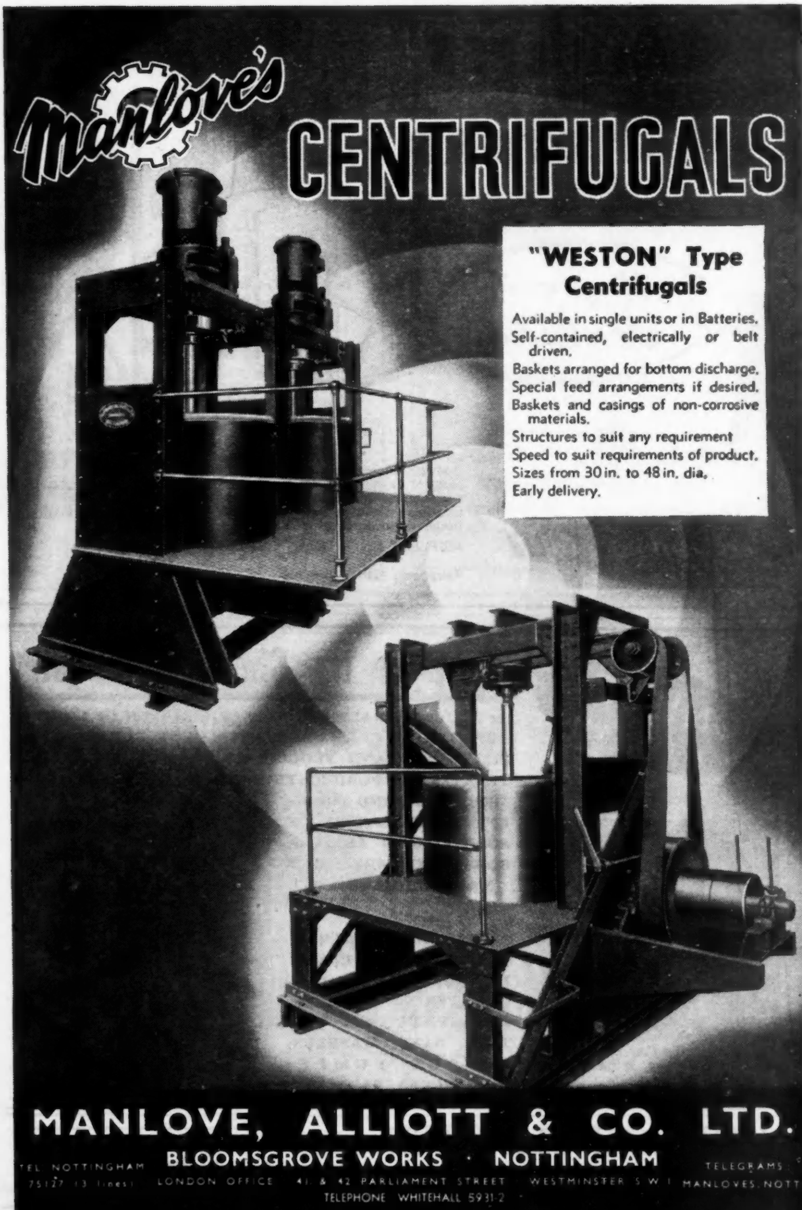
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THE ROTOPUMP

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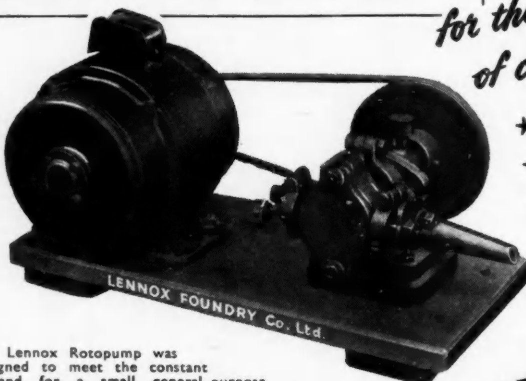

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Publicity for Applied Research

NEARLY three-quarters of the firms in Britain's manufacturing industries employ less than one hundred people each, and, of these, more than half employ less than twenty-five people each. It is evident, therefore, that one of the main problems of industrial research is to bring the results of scientific investigations to the attention of small firms. Publicity is as necessary for research as for any branded product.

The DSIR are fully alive to the importance of 'putting science across.' Full advantage is taken of the co-operation accorded by the trade and semi-technical Press, while no opportunity is lost of co-operating with the B.B.C. in the preparation of scientific features for the radio and television programmes. Open days are held periodically at the various research stations and Press conferences or visits are organised in connection with special pieces of research. Much time and money are spent on the preparation of exhibits at industrial or scientific exhibitions. Some research stations make their own films and show them to local societies. Talks are given to Rotary Clubs and to local branches of technical institutions. With certain notable exceptions most of the research associations also devote considerable attention to publicity.

Yet it cannot be said that a satisfactory degree of liaison is being achieved between science and industry as a whole. The British Welding Research Association is very publicity-minded. Nevertheless its exhibitions held in London and Glasgow during 1950 revealed that many industrialists concerned with welding had never even heard of the existence of the BWRA, and were delighted to discover an organisation from which practical advice on welding problems could be obtained. The nature of some of the questions answered suggested that industry was still struggling with difficulties which the Association had succeeded in overcoming. No doubt a similar state of affairs exists in other industries.

It has sometimes happened that popular articles in daily papers or television features have shown technicians how difficult production problems could be solved. Yet the equipment or method featured had already been extensively publicised by Press releases or technical articles in appropriate journals. It would appear, therefore, that there is no single medium by which the findings of scientists can be brought to the attention

of all industrialists who might be interested.

If—as seems probable—many firms are out of touch with scientific progress, what can be done to remedy this particularly costly form of waste? Publicity for research is limited by the amount of information which scientists are willing to divulge. By the very fact that they have been trained to accept nothing without adequate evidence, many scientists shun publicity until an investigation has been finalised, although a long period may necessarily elapse before theoretical conclusions can be fully substantiated. Yet it is often in the public interest that promising results should be brought to the notice of industry with the minimum delay. It is probable, too, that interest is stimulated if industrialists are advised when investigations are started and are kept in touch with their progress by interim reports. Publicity should also be accorded to investigations which fail to produce the desired results, since even negative information may have a positive value. Moreover, there might be a more sympathetic and understanding attitude towards scientists if the public knew more of the difficulties and disappointments which their work so frequently entails.

It is possible that to be fully effective, publicity in the Press and other media requires to be followed up by personal contact. Valuable benefits may therefore result from the Regional Activities which have recently been inaugurated by the DSIR. It is planned to give talks to Regional Boards of Industry and Chambers of Commerce throughout the country, one of the principal aims of this service being to interest the smaller firms. Liaison has recently been established with the Industrial Association of Wales and Monmouthshire, to whom a member of the DSIR staff has been loaned for a year as Scientific Liaison Officer.

Scientists themselves could do much to further the cause of research by leaving their ivory towers more frequently to establish personal contact with the men and women at the benches. A worker in the building industry, for example, is unlikely to be greatly interested in a more economical method of making concrete. If it is explained to him, however, that the conservation of cement is of critical importance to the rearmament and housing programmes, it is possible that his co-operation might be secured. Work is usually done better when it is related to something intelligible and bigger, as wartime experience clearly showed. By visiting factories and helping to put their own work across, scientists would also gain a practical insight into industrial processes and requirements, which might suggest extremely valuable avenues for research.

Finally, it might be pointed out that many scientific reports would be more widely read if they were written in simpler language. There should be no place for scientific jargon in publications which laymen are expected to understand. Some recent research notes published by H.M. Stationery Office for DSIR research stations are refreshingly simple and practical. Unfortunately, these desirable qualities are by no means characteristic of all the Department's reports.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 35s. Single copies, 9d.; post paid, 1s.: SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3954/5). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

Notes & Comments

Looking Back

OUTLOOK for the British chemical industry in the year now beginning appears slightly brighter than at the start of 1951. Yet despite the difficulties of raw material shortages and the burden of taxation the industry has a record of steady progress to its credit during the past 12 months. New plants have been brought into operation, new research laboratories opened, known processes improved and fresh methods evolved. Overseas trade reached new records, the value of chemicals, drugs, dyes and colours for the first 11 months of 1951 being £131,414,967 compared with £107,432,727 for the whole of the previous year. This, despite the scarcity of sulphur, which as recorded in a number of company reports, proved a serious handicap to the fulfilment of export orders. The sulphur problem indeed, although perhaps never quite reaching the severity at one time feared, is likely to persist for a considerable period, and steps were wisely taken as a long-term aid to its solution by the formation of the United Sulphuric Acid Corporation to produce sulphuric acid from pyrites, and later by the establishment of the Sulphur Exploration Syndicate to exploit new sources of sulphur. While perhaps no particular achievement appears at present to be outstanding in 1951, it must be borne in mind that advances in all fields are moving rapidly and the fruit of much pure research or results of its application may not become apparent for some time to come.

Looking Forward

WHAT of the future? Prospects for raw materials for the British chemical industry are decidedly more favourable than a year ago. Stocks are still not satisfactory, particularly in metals, of which a decline is shown in steel, scrap, zinc concentrates, zinc metal and imported lead. Lead is not itself short, but deliveries from Australia have been delayed by shipping difficulties. On the other hand improvement is shown in stocks of copper by 10 per cent, sulphur by 25 per cent and an increase in all three categories of rubber. The Ministry of Materials anticipates improvement in the supply position except in zinc, sulphur, and tungsten. A change in the allowance for depreciation would do much to encourage replacement of plant or installation of new equipment, at present almost prohibited by the exorbitant costs entailed, and might perhaps help to overcome the reluctance—recorded in so many of the Anglo-American productivity team reports—of the British worker to adapt himself to new ideas and machinery. The great oil refineries springing up throughout the United Kingdom are vast potential sources of new chemicals. A serious problem which must be tackled by industry and the Government is the shortage of scientific manpower—particularly chemical engineers—and the training of technologists.

Beryllium Poisoning Antidote?

A TEAM of research workers at the Argonne National Laboratory, Chicago, have announced the discovery of what they believe is the first successful antidote to beryllium poisoning. This is aurin tricarboxylic acid or ATA. It combines with beryllium salts by a similar reaction to that of dye fixation by metallic salts. In this case, the resultant co-ordination compound is a non-toxic substance. So far, ATA has proved to be an excellent antidote in laboratory cases of animal poisoning with beryllium, cases in which the amount of beryllium given would otherwise have been fatal. If ATA proves to be a satisfactory antidote to beryllium toxicity with humans, the use of this metal in atomic pile construction will become more likely. The serious hazards associated with beryllium—as revealed in its earlier use in fluorescent lamp manufacture—have so far been a major obstacle to wider technical developments.

IN THE EDITOR'S POST

New Analytical Indicators

SIR,—I was deeply interested in Mr. W. I. Stephen's excellent review on new indicators, published in your issue of 8 December. Particularly do I support his expression of regret that a number of quite unnecessary indicators have been proposed within recent years.

May I stress another aspect of this matter. Many workers have examined commercial dyes and have found the samples in their possession to possess what appear to be valuable indicator properties, and they have proceeded to publish their results. It is not surprising that in many cases other analysts have been quite unable to repeat these results. Commercial dyestuffs are not produced for analytical purposes. Many of them are mixtures of a number of identified and unidentified constituents and they tend therefore to be very varying percentages of inert diluents may product and another's. Even when a definite constitution may be attributed to the dye itself, variations in concentration due to varying percentages of inert diluents may cause no end of trouble when trying to duplicate a mixed indicator in which the proper balance of the various dyes is usually somewhat critical. If an organic dye is to be applied to a scientific purpose, whether as an indicator or as a microscopical stain, or as a colorimetric reagent, its identity and purity should be as well established as that of any other chemical reagent. This necessity may seem self-evident, but it has so frequently been neglected.

May I correct one passage in Mr. Stephen's review. He states that Tetrabromophenol Blue is not commercially available in this country. In point of fact it has been available from this company for several years past.—Yours faithfully,

W. C. JOHNSON.

Chief Chemist,
Hopkin & Williams, Ltd.

Completes Half Century

Mr. Sydney Harvey Honoured

SON of the founder and present chairman of G. A. Harvey & Co. (London), Ltd., Mr. Sydney Harvey was recently presented with an illuminated volume, commemorating his 50 years' service with the firm.

Mr. H. T. Eatwell, managing director, in opening the proceedings, expressed on behalf of all employees, the honour of paying tribute to Mr. Harvey on his achievement, and asked him to accept the volume as a token of esteem and goodwill. Concluding, Mr. Eatwell said that it was thought fitting that the longest serving works employee, Mr. F. W. Brown, should make the presentation, and called upon him to do so. Mr. Brown, who has almost served his 50 years, then presented the volume.

Accepting the book, Mr. Harvey said that this was a very happy occasion and an important milestone in his life.

'Those of you who remember my father, who laid the foundations of this business', he said, 'can imagine how deeply touched he would have been by the warmth of feeling which has inspired this tribute.

'As many of you know, I started at Lewisham as a boy of seventeen; looking back over this half-century of service, the years have passed all too quickly. But a great deal has been accomplished in that time.

'The removal from Lewisham; the erection of most modern buildings covering some thirty acres; and the installation of up-to-date plant; housing estates; sports ground; welfare, etc., and this progress has been an inspiration and a pleasure not only to me, but to all concerned.

'During that period we have had to face together adversity, trouble, danger and even sorrow; but we have been able to endure and achieve because of the real friendship that has existed between us, and the whole-hearted support of a very grand team of willing and efficient helpers.

'No man can or ought to pledge the future—"Time and chance happeneth to all". I can only say that my own desire—and this very happy little ceremony strengthens that desire—is to carry on for some time to come and that the company may continue to progress from strength to strength'.

Mr. Harvey concluded by thanking everyone for their good wishes, for the wonderful gift and for the kindly thought and friendship which prompted it.

Notice of Removal

The Geigy Company, Ltd., announce that as from 27 December, 1951, its address was changed to Rhodes, Middleton, Manchester. (Telephone: MIDdleton 3933 and 3644—7).

Chemistry & The Food Industry

British Team's Report on Visit to U.S.A.

CHEMISTRY plays an important rôle in the modern food industry, and its significance in raw materials, pest control, and scientific control and research are emphasised in a recent report 'Packet Foods', by a productivity team representing the British Packet Foods Industry which visited the U.S.A. in March and April last year, and which is now published by the Anglo-American Council on Productivity (4s. 6d.).

'Supplies paradise' was a phrase coined by one member of the team to describe the situation in America where the variety. quality and quantity of raw materials is virtually in contrast to the austerity experienced in Britain for more than 10 years.

Quality standards of raw materials were very high and strict laboratory control was exercised in almost all plants.

Regulations under the Federal Food, Drug and Cosmetic Act of 1938 governing the use of colourings in foods were exceptionally strict. A list of colourings 'which were harmless and suitable for use in foods' had been drawn up by the Federal authorities and manufacturers might use only these colourings or a combination of them. The list now contained 19 colourings: five red, two orange, six yellow, three green, two blue and one violet.

Sample Submitted for Inspection

A sample from every individual batch of colouring must be submitted, normally by the colourings manufacturer, to the Federal Security Agency in Washington, for certification that the batch meets the stringent official standards of identity and purity. These regulations ensured a very high standard for food colourings in the U.S.A.

The only acidic ingredients permitted by the Federal standard for self-raising flour were calcium acid phosphate, sodium acid pyrophosphate or a mixture of the two. The same chemicals were commonly used in cake mixes and allied products.

Antioxidants were added to oils and fats to retard the development of rancidity during storage. The Bureau of Animal Industry of the U.S. Department of Agriculture had approved a number of antioxidants as suitable for use in edible oils and fats and had issued regulations specifying the combinations and concentrations in which they might be used. In the following list of these substances the maximum permitted concentrations are shown in brackets.

(1) Resin guaiac (0.1 per cent).

(2) Tocopherols (0.03 per cent).

(3) Lecithin.

(4) Citric acid (0.01 per cent).

(5) Nordihydroguaiaretic acid (NDGA) (0.01 per cent) with or without citric acid (0.005 per cent) or phosphoric acid (0.005 per cent).

(6) Propyl gallate (0.01 per cent) with or without citric acid 0.005 per cent).

(7) Thiodiproprionic acid (0.01 per cent) and/or dilauryl thiodipropionic and/or distearyl thiodipropionate; the total concentrations of the last two substances must not exceed 0.09 per cent.

(8) Butylated hydroxyanisole (BHA) (0.02 per cent) with or without nordihydroguaiaretic acid (0.01 per cent) or propyl gallate (0.01 per cent). Citric acid (0.005 per cent) or phosphoric acid (0.005 per cent) may be added to these combinations.

Use of antioxidants in foodstuffs is not at present permitted in the U.K.

Examination of production methods and factory buildings showed that the liability of cereals to infestation of various kinds resulted in close attention being paid to control measures. These included:—

(a) Space fumigation with hydrogen or methyl bromide by outside contractors.

(b) Local disinfestation by spraying,

(c) Rodent control by outside contractors.

(d) 'Entoleting'.

(e) Sterilisation by heat.

(f) The addition of an insect-repellant to carton- and case-sealing adhesives.

(g) Treatment with insecticide of board used in lining rail cars.

With regard to (e), sterilisation by heat was carried out by a firm which suffered an unfortunate experience with the use of hydrogen cyanide. The usual mill heating system was used to its full capacity and boosted with portable hot-air blowers. The introduction of steam further assisted the

raising of the temperature and also maintained reasonably humid conditions to prevent drying out of floors and other woodwork and damage to belting. A temperature of 135°F. for 30 minutes was stated to be quite effective in killing all forms of insect life.

Sealing Adhesive Addition

With regard to (f), the addition of a repellant to a sealing adhesive was a novel feature and it was claimed that the incidence of infestation had been reduced by half at a very low cost. It must be understood, of course, that this did not prevent the development of any infestation inherent in the product; the precaution was against infestation from outside.

This constituted a real hazard for all cereal packers and must be more evident in the U.K. where, by reason of supply limitations, packages were less resistant to invasion by infesting insects.

In response to a request for detailed information on this subject, the following reply was received:—

'The name of the insect-repellant is Pyrenone—RE 666, and it can be purchased from U.S. Industrial Chemicals Inc., 60 East 42nd Street, New York, 17. It is a trade name for an insecticide made of pyrethrins and piperonyl butoxide; 1.25 per cent of this material is used based on the total glue weight but the amount can be cut to 1.0 per cent with quite satisfactory results'.

Pyrenone is now being manufactured in the U.K. under the name Pybuthrin by Cooper, McDougall & Robertson, Ltd., Berkhamstead, Herts.

With regard to (g), at one factory the same insecticide (Pyrenone) was sprayed on to the corrugated board used for lining rail cars and this was stated to give a considerable degree of protection in transit.

Factories visited ranged in size from medium to very large, and naturally considerable variations were observed in the provision made for quality control and research work in respect of staff, laboratory accommodation, fittings, apparatus, library, and other services.

At one factory, which had been making virtually only one simple product for many years, there was no laboratory. At another, the laboratory was very small and routine samples were mostly sent to an outside analyst. At all the other factories visited there were laboratories which, in general, compared more than favourably with those in food factories of similar size in the U.K. Several firms—not only the largest—had scientific organisations of outstanding quality.

In the smaller factories it was usual to find both control and research being carried on in the same set of laboratories and, to a varying degree, under the supervision of the same senior staff. In a number of the larger firms, however, the functions had become more or less completely separated in both space and organisation. Sometimes they were united at board level in the person of a director of control and research, but this was not always the case.

This separation was no doubt administratively convenient and perhaps essential where research was concentrated in a central establishment and scientific control was necessarily spread through the firm's different manufacturing units, some of which were often geographically remote from the centre. The system would seem, however, to suffer from certain drawbacks.

It might become difficult, for example, to staff the control organisation satisfactorily because of the reluctance of most first-class men to engage indefinitely in work which by its nature was largely routine, and this effect was likely to be accentuated if the status of the control side within the firm's organisation, and the resources which were devoted to it, were palpably inferior to those enjoyed by the research side.

Effort to Break Barrier

Discussion showed that these problems of organisation were not unrecognised by at least some industrial scientists. It was interesting to find that one large food manufacturing group was now making a conscious effort to break down the barrier between control and research by encouraging exchanges of personnel between the two; by trying, wherever possible, to associate the control staff with specific research projects; and by encouraging the carrying out of at least some research in all control laboratories. These moves were spoken of as representing a reversal of the trend to extreme concentration of research facilities which still continued in most branches of U.S. industry.

In practically all the factories visited the scientific staff enjoyed a satisfactory status. In many factories it was apparent that the senior members of the scientific staff played a greater part in policy-making and in top

management than is generally the case in the packet foods industry in the U.K. It was not uncommon to find at least one of the firm's scientists at board level and working in touch with all branches of the business. It seems certain that the prevalence of scientifically trained administrators in the highest posts in the industry was an important factor in securing the application of research results to production.

Control and Research Costs

Figures for expenditure on control and research were naturally not often available, but with both the average was certainly higher than for comparable sections of the food industry in the U.K. One moderately large firm was spending the following amounts on research in 1951:—

	$	£
Current expenses :		
Laboratory services	15,000	5,357
Packaging research	20,000	7,143
Basic research ; military foods ; new products	100,000	35,714
Fats and oils research ; pilot plant operation	130,000	46,428
Baking technology ; product improvement	50,000	17,857
Miscellaneous	35,000	12,500
Capital expenditure	75,000	26,785
	425,000	151,784

Research laboratories (mostly built since the war) and their equipment were valued at $600,000. The staff totalled 25 graduates (three Ph.D.'s), 15 laboratory assistants and ten service personnel. A large and excellently equipped control laboratory was maintained in addition.

A considerably larger firm had a central research laboratory with a staff of 140 (75 graduates, including 25 Ph.D.s) which was devoted mainly to investigations of current importance; the present annual budget of this laboratory was $1,600,000 (£571,400). In addition, the firm benefited as a subsidiary from the work of a research institute with a staff of 240, which was maintained by the parent corporation for long-term fundamental investigations into the raw materials of the industry. The control system of this firm was also notable for its thoroughness and efficiency.

At practically all the factories visited it was accepted that quality should be controlled by the laboratory independently of the production department, and in all but two factories the chief control chemist reported direct to top management. This situation was markedly different from that apparently prevailing in another section of the U.S. food industry, namely the meat industry, in which quality was still a production responsibility in most factories.

Raw Materials Specification

Specifications of raw materials were practically always a laboratory responsibility, and normally everything was sampled and examined before being used. Procedures for sampling varied greatly at different factories and with different raw materials, but were usually facilitated by the fact that deliveries were often made in large units, that is car loads. A 'rail car' is defined in a glossary of American terms published with the report as 'railway box car or wagon, capacity approximately 60,000 lb. gross.

At all the laboratories visited most analyses and tests were made according to the official procedures of the Association of Official Agricultural Chemists (AOAC), the American Association of Cereal Chemists (AACC), or the American Society for Testing Materials (ASTM).

The Brabender moisture oven was often used where large numbers of determinations had to be made and was generally said to give good results if calibrated against the AOAC vacuum oven method. Electric moisture meters were frequently used both in the laboratory and on the factory floor.

Good results were said to have been achieved at one factory which used the Karl Fischer titration method.

In one laboratory the sucrose content of factory batches of dessert powder was quickly determined by examining a cold aqueous extract in a polarimeter.

At another factory an approximate determination of the starch in dessert powder was rapidly made by centrifuging a cold-water suspension in a calibrated tube and reading off the volume of the starch which separated.

The Bloom gelometer had been used in the U.S.A. for measuring the strength of both starch gels and made-up desserts, but results had not apparently been entirely satisfactory.

Several of the laboratories visited participate in the National Check Sample Service. This was operated by the National Check Sample Committee of the American Association of Cereal Chemists on a non-profit basis as a service to its members. Collaborators receive a regular series of samples

by means of which they can check the accuracy of their analyses.

So far as could be ascertained, the laboratories visited were almost exclusively engaged on researches connected more or less closely with the firms' commercial activities. The research was thus of the type usually referred to as 'applied', in distinction from 'pure' research conducted without immediate thought of practical application. In the present report the term 'research' signifies applied research unless otherwise qualified.

It was natural, therefore, that research subjects and results were in general confidential. Broad indications were obtained, however, of the main lines of current U.S. research in the packet food and allied industries.

The generally high standard of accommodation, fittings and equipment has already been mentioned. The design and layout of the best laboratories would be hard to match in any other country.

Excellent American Services

Excellent service provided by U.S. laboratory furnishers and apparatus makers was especially commented on by the team. Quality of their products was in general high, and with many items a larger selection of types and sizes was available than in the U.K. Deliveries from stock were commonplace. It was also comparatively easy to get a specially designed instrument or piece of physical apparatus made to order, which was a factor of great importance in the development of new techniques and procedures.

Only the very largest laboratories can maintain properly equipped and staffed instrument-makers' workshops of their own, and the frustrations from which most laboratory workers in the U.K. suffer in trying to get special apparatus made to a reasonable standard of workmanship, and at a reasonable price, are a serious brake on progress.

Standard of the reference libraries attached to the research laboratories was, with one or two outstanding exceptions, rather lower than might have been expected. In one large research establishment, for example, library expenditure was only 0.2 per cent of the total research expenditure. In some instances, however, there was easy access to neighbouring public or academic libraries, and in one area several industrial laboratories had a mutual loan system which appeared to work well.

In the New York area an excellent photostat service was provided by the New York Public Library. Orders for photostat copies of scientific papers might be telephoned to the library in the afternoon and copies were received first post next morning.

An experimental kitchen was included in all the research laboratories visited and most of them are exceptionally well fitted and equipped. These kitchens played an important rôle in the formulation and evaluation of new products and recipes, and were usually also responsible for checking the standards maintained by the control laboratories, especially where there were a number of these in different factories.

Most of the research laboratories visited had attached to them a pilot plant equipped with a variety of mixers, driers, sifters, grinders, experimental mills, ovens and other semi-scale equipment appropriate to the processes operated in the factory.

With the smaller laboratories this equipment was usually contained in the laboratories proper, but the pilot plants associated with the largest laboratories were virtually small experimental factories, housed in specially-designed buildings and with their own scientific and technical staffs, control laboratory and well-equipped workshops, where plant could be fabricated and assembled as required.

Importance of Pilot Plants

Pilot plants of any pretensions are not often found in U.K. food factories but there can be no doubt whatever of their importance. Even a relatively modest pilot plant can serve as a link between the research laboratory and the factory, enable existing and new processes to be studied and compared under controlled conditions, and facilitate the speedy and economic application of research results to production which is so urgently needed if industry in this country is to meet world competition.

In spite of some difficulties in administration and organisation, which are perhaps largely symptoms of size and of relatively recent growth, the broad picture presented by science in the food industry in the U.S.A. is a most impressive one. In general, the more careful attention was paid to quality, research proceeded continuously and vigorously, and promising results were applied with energy and without delay. Very large sums of money have been and are

being spent on scientific activities; the returns were there for all to see.

More than one of the leading industrial scientists met during the tour made generous acknowledgment of the pre-eminence of this country in pure research, but quite rightly claimed a leading part for the U.S. in applied research. It is fair to say that the quality of British work in this field is at least the equal of American work; it is to be hoped that an increasing number of British food manufacturers will take advantage of this fact and encourage the *application* of scientific methods throughout the industry.

The Team's Recommendations

1. Steps should be taken by all firms to make some measurement of productivity as a basis upon which future results can be assessed.

2. Management should introduce as high a degree of mechanisation as possible, as appropriate machinery becomes available, so as to cut out all heavy physical work and movement which can be performed more economically by machinery. Particular attention should be paid to continuity of operation and bulk storage and conveying methods.

3. British food machinery manufacturers should design and produce new machines in close collaboration with the food manufacturer, both for existing and new products, and should study the whole production line, not only individual units.

4. British food manufacturers should make certain that the knowledge gained through research is given practical application on the factory floor. We draw particular attention to the help obtainable from pilot plants, however small.

5. Close attention should be given to the construction and layout of offices and factories, particularly in regard to lighting, heating, ventilating and air-conditionng.

6. Bearing in mind the possible future of self-service stores, consideration should be given by manufacturers to the attractiveness and individual character of their packages.

7. This Report should be regarded as a starting point for further discussions of methods, techniques and manufacturing problems between the American and British food industries.

8. An American team, drawn from the same sections of the food manufacturing industries, should visit the U.K. for further exchange of ideas.

U.S. Chemical Expansion

WITH capital spending for 1951 estimated at $2,140,000,000, the chemical industry in the U.S.A. is expanding more rapidly than any other division of manufacturing, according to a survey by the Alexander Hamilton Institute, Inc., New York City. Chemical production for 1950 was at the index level of 200, using the 1935-39 average as 100, but by March 1951 the index had risen to 220, and will probably close the year at 235 or 240.

Rapidity with which the chemical industry is growing is pointed out by expenditures for plant expansion. Expansion plans for all industry in 1951 indicated a rise in dollar outlays of 45 per cent over 1950, while expansion plans for the chemical industry call for a jump of 59 per cent. The estimated 1951 capital expenditure is the largest amount scheduled by any industrial group and $795,000,000 more than that of the steel industry, the nearest manufacturing competitor.

Phenol Plant for Canada

THE great importance of phenol to Canada's rapidly expanding industrial economy was underlined recently by the announcement that the Canadian Kellogg Co., Ltd., a subsidiary of The M. W. Kellogg Company, refinery and chemical engineering-contracting firm of New York City, has been awarded a multi-million dollar contract for a unique phenol plant at Montreal for B.A.-Shawinigan, Ltd., a new company jointly owned by the British American Oil Company and Shawinigan Chemicals, Ltd.

According to Kellogg, the new plant, which will produce 13 million pounds of phenol annually, will be the first commercial unit of its type. It employs a process under license from the Hercules Powder Company, of Wilmington, Delaware, and The Distillers Co., Ltd., London, by which cumene, a petroleum derivative, is oxidised to produce both phenol and acetone. Cumene will be piped from the Montreal refinery of British American Oil Company. Both phenol and acetone, upon completion of the unit, will be available for sale to Canadian industry and for export.

Polish Technical Abstracts

Poles Aim at International Co-operation

AN interesting publication 'Polish Technical Abstracts' (No. 2, 1951) reached us recently. This is a collection of abstracts of articles, books, pamphlets and other publications appearing in Poland, and is bilingual, alternate pages giving the Russian and English versions. It claims to deal with original contributions which constitute a step forward in technical progress; with publications in which papers by foreign authors are discussed, either to give a critical analysis of their thought or to consider them from the point of view of their suitability for adoption in Poland; and with publications which deal with the economic problems arising in technology.

The present issue contains selected articles published in 1949-50. The section dealing with Chemistry and Chemical Technology comprises 20 out of the 160 pages, while Metallurgy and Food Technology have 18 and 6 pages devoted to them respectively. It cannot be said that any fundamental contributions appear in any of these sections. However, it is perhaps of interest to look more broadly at the abstracts as a whole.

The first impression is that Russian thought has had a marked influence on Polish science, partly as shown by direct reference, and partly as an inference, from reference to such institutions as the State Investment Plan of the Planned Economy of Socialism.

Results not Revealed

Secondly, the abstracts frequently only indicate the subjects treated, giving a vague indication of the nature of the treatment, and are non-committal about the actual results obtained, contenting themselves with a suggestion that the results were interesting. In a number of cases, however, where positive statements are made, they are often adequately represented by the statement that 'a comparison of sulphonated coal and an American kationite proved the superiority of the home products'; or by the claim implicit in one abstract that the sound film system was invented by Eustachy Bialoborski and Wiktor Unger; or by the passing mention that the author took part in the first applications of arc welding to locomotive boiler construction; in other words, priorities and national excellencies seem to preoccupy many workers.

On the whole, however, the impression is that Poland is now taking technology seriously. Central and trade institutes have been formed, and many of the abstracts discuss improvements in building, transport and the like.

Finally, it is of interest to note that international co-operation is aimed at in two ways. Firstly, the abstracts are all indexed according to the Universal Decimal Classification. And secondly, it is stated that the publishers (Glówny Instytut Dokumentacji Naukowo-Technicznij, Warszawa 12, Ligocka, No. 8) will supply photocopies, microfilms and translations in Russian, English, French or German of documents abstracted in this publication.

The New Year Honours

IN the New Year Honours List, Professor R. A. Peters, F.R.S., Whitley Professor of Biochemistry, Oxford University, was designated a Knight Bachelor, and Dr. Harold P. Himsworth, F.R.C.P., secretary, Medical Research Council, a K.C.B.

Other honours conferred included the following:—

C.B.E.: G. L. Bailey, M.Sc., Director of Research, British Non-Ferrous Metals Research Association; J. P. Berkin, manager, Shell Petroleum Co., Ltd.; T. A. F. Board, director, Distillers Co., Ltd.; F. St. A. Hartley, keeper, Science Museum; H. Hartley, D.Sc., chairman, Radiation, Ltd.; T. P. Hilditch, D.Sc., F.R.I.C., F.R.S., lately Campbell Brown Professor of Industrial Chemistry, University of Liverpool; F. M. Lea, O.B.E., D.Sc., F.R.I.C., director, Building Research Station, DSIR.

O.B.E.; W. H. G. Lake, Ph.D., works manager, I.C.I., King's Norton; H. R. Payne, head of safety organisation, I.C.I., London; R. T. Rolfe, F.R.I.C., chief metallurgist, W. H Allen & Sons and Co., Ltd., Bedford; A. H. Searl, M.C., lately Director of Non-Ferrous Metals, Ministry of Materials.

M.B.E.: H. Bramhall, M.M., Section Operating Manager, Winnington Works, I.C.I.; C. W. Croxon, Senior Experimental Officer, DSIR; L. P. Ingram, M.Sc., A.R.I.C., Sub-Divisional Manager, South-Western Gas Board; H. Joynes, works' manager, Stafford Salt Works, I.C.I.; J. W. R. Naden, chief metallurgist, Chesterfield Tube Co.

Training of Laboratory Technicians

Investigation by the Science Technologists' Association

PROGRESS of the Science Technologists' Association, its objects and achievements since it became operative in July, 1948, are surveyed in a report recently issued, which emphasises that the association is not a trade union, but was established to raise the status of and provide schemes of training for technicians in science laboratories in educational institutions and industry throughout Great Britain.

Membership of the association is divided into three classes and application may be made for Student, Associate or Full Membership.

(a) *Student.* A person over the age of 16 years who is in full-time employment as a technician in a scientific laboratory or allied employment, who holds a General Certificate of Education, or the present School Certificate, or a Senior College of Preceptors Certificate in English, Elementary Mathematics and General Science or who produces satisfactory evidence of having reached an equivalent level of general education and who is in 'Good Standing'.

(b) *Associate.* A person who has after admission as a student member remained in full-time employment as above, who has attended a recognised course of training for a period of not less than three years and passed a recognised examination at the termination thereof and is in 'Good Standing'.

Exemption Applications

Application for exemption supported by evidence of five years' experience in an approved laboratory or allied service and suitable testimonials may be submitted by technicians of 25 years or over for a strictly limited period expiring on 9 July, 1952.

(c) Full. This class consists of:

(i) Founder members.

(ii) Ordinary members who have obtained diplomas.

(iii) Technicians with approved qualifications in other institutions or associations.

(iv) Technicians over 30 years of age with not less than 15 years' experience in science or allied laboratories.

The training scheme as approved by the STA is a five-year course of study, three years to a certificate and a further two years to the diploma.

Regulations and examination syllabuses for the certificate have been prepared. The special techniques provided will cater for the majority of candidates, but others will be added when there is sufficient demand.

Syllabuses of Training

For the diploma examination regulations have been prepared and approved by the council and are available to all members of the association. Syllabuses of training are in preparation and it is hoped that by next session a number of different techniques will have been catered for.

Associate members elected under (b) will not have to take the certificate examination and may proceed to the diploma course as and when it is started. Full members elected under (c) (i), (iii), and (iv) will be exempt from examinations but are eligible to take the Fellowship.

Fellowship examinations have been drafted and approved by the council. Syllabuses and regulations will be sent to members on request.

Qualifications of other bodies as being suitable for exemption from whole or part of the STA certificate examination are being considered. For the present recognised exemptions are:—the intermediate certificate examination of the City and Guilds of London Institute and the certificate of the Glasgow University Apprentice Technicians' Training Scheme which is coupled with the ordinary National Certificate.

Great importance is attached to the branches of the association of which there are at present four—in Edinburgh, Glasgow, Cardiff and Oxford. As the conception of the training and certification of technicians expands and becomes of national interest, the demand for teachers and examiners will increase. The association will be called upon to meet this demand and it is considered that the easiest way will be through a large and active branch. The branches have the further advantage of bringing technicians together and allowing the interchange of ideas and viewpoints.

A *Bulletin* of the association's activities is published bi-monthly and sent free to all registered members.

Since the association became operative

considerable progress has been made, and membership is now only a little short of 600. Financial affairs have shown a marked improvement, bringing nearer the formation of an institute with a registered address and paid officers.

Central Register Completed

Preparation of a central register or card index with complete details of all members has been completed. This should prove a particularly valuable idea and will help to achieve another objective—the registration of all qualified technicians.

Work already done in the preparation and expansion of the syllabuses is considerable. The association was fortunate in having had three years' teaching experience at Paddington Technical College and lessons learned there have been used to their full advantage. The course at Paddington, although started on the syllabuses prepared by the STA, has now changed to those of the City & Guilds of London Institute. This is disappointing, but not calamitous. The teaching is being done almost entirely by Full Members of the association and they have more than proved their ability to teach these subjects.

A scheme of training based on STA certificate syllabuses has now been started on a co-operative basis between Imperial College, Kings College and University College. Some 30 junior technicians are taking the first year course and the classes are held in whichever college can offer the best facilities. It is hoped that with this start other colleges will follow. This, coupled with the interest shown by the Collegiate Council of the University of London, and the steps being taken by the association to interest the Vice-Chancellors' Committee, will perhaps make it possible to set up training committees and start courses in colleges and schools of the universities throughout the country.

It is the immediate aim of the association to set up training committees in all colleges and institutions to examine the question of the training of technicians, if necessary by internal schemes, and to interest the authorities concerned. Much good work can be done on these lines and technicians are asked to examine this idea closely.

The association is rapidly expanding and new members are being enrolled steadily. Potential membership is large and the immediate aim is to build up a substantial and enthusiastic membership to give the association standing and authority in the shortest possible time. The immediate benefit to established technicians may not be very apparent, but this body belongs to the technicians and is a long-awaited opportunity for them to achieve professional status and recognition of their abilities and place in organised science.

President of the association is Professor C. H. O'Donoghue, D.Sc., F.Z.S., F.R.S.E. The hon. general secretary is F. W. I. Croker (London); hon. treasurer, R. Brinsden (London); hon. registrar, F. C. Padley (Reading), and F. R. N. Pester (London) is editor of the *Bulletin*.

At a meeting convened by the Science Technologists' Association held at the Imperial College, London, towards the end of last year, a resolution was unanimously passed:—

'That this meeting recognises that the training of laboratory technicians should be essentially vocational rather than academic, and would favour the adoption of the syllabuses of the Science Technologists' Association Certificate Examination as most adequately fulfilling this requirement'.

U.S.A. Magnesium Output

AT THE annual meeting of the American Magnesium Association it was reported that the U.S. output of magnesium during 1951 is expected to show a gain of 125 per cent over last year's production, and output in 1952 will probably gain just as much over last year's figures. Primary magnesium production in the first three quarters of 1951 totalled 47 million pounds. In the final quarter, it was estimated that 33 million pounds was produced. This, along with an expected 16 million pounds from secondary sources, will bring total production in 1951 to 97 million pounds, as compared to 43 million pounds last year.

Hard work, careful product development, and better planning on the use of magnesium (it was said) had built a sound foundation resulting in a strong and sustained growth curve for the industry, a growth not exceeded by any other metal at a comparable time in its development. Other metals, it was stated, may be as abundant, but no other metal is so widely available in such a simple form, so readily reducible to a usable form.

Sulphur from Petroleum Sources

The Claus Recovery Process

UNITED States sulphur production in 1950 was 5,342,184 long tons. This is nearly one million tons less than the estimated demand by consumers of American sulphur, both domestic and foreign. As a result, operations in the petroleum, chemical, and metallurgical industries have been severely hampered, and determined efforts are being made to increase production of this essential raw material. Britain, cut off from some of her normal sulphur imports, has been forced to turn to the production of sulphuric acid from anhydrite and coke, a costly process which is economically tolerable only in an emergency situation. Other sources being opened to exploitation include coal and pyrites.

But probably the most important boost will be given to sulphur production from two sources.

(1) The exploitation of a newly discovered sulphur deposit in the Mississippi delta. This important discovery was made in the course of recent oil drilling operations by the Texas Gulf Company. Beginning in 1953, this deposit is expected to be mined at the rate of 500,000 long tons of sulphur annually.

(2) The production of elemental sulphur from by-product hydrogen sulphide recovered by the oil and gas industries. This operation is international in scope. Some seventeen plants are expected to be on stream in the United States by the end of 1952. Two 32 ton-a-day plants are under construction at Alberta, Canada (for Shell Oil Co. and for the Royalite Oil, Ltd.) and England's famous new Fawley refinery will have a sulphur recovery plant in operation by the end of 1952. Other plants have been reported for Italy, France, and Germany.

Hydrogen Sulphide Extraction

In each case, the process involves the extraction of hydrogen sulphide from hydrocarbon gases by some standard scrubbing process (ethanolamine, sodium carbonate, alkazid, etc.). After recovery in concentrated form, hydrogen sulphide is converted to elemental sulphur by partial combustion in one of the recent modifications of the Claus process.

In its original form, the Claus process was carried out in accordance with the equation:—

$$2H_2S + O_2 = 2H_2O + 2S + 191{,}000 \text{ B.Th.U.} \quad \ldots\ldots (1)$$

The reaction is catalysed by bauxite containing at least 20 per cent Fe_2O_3. The very considerable heat evolution introduces a design problem of first magnitude. Unless special steps are taken for adequate cooling (*e.g.*, by the use of Houdry catalytic converter), it is necessary to hold the space velocity below 3 $hr.^{-1}$.

With the large sulphur capacity required of an economically competitive Claus plant (at least 15-20 tons per day), so low a space velocity would evidently be prohibitive. All modern Claus plants therefore operate by one of two alternate routes:—

(1) Hydrogen sulphide may be burned to SO_2 in a waste-heat boiler, according to the equation:—

$$H_2S + 1\tfrac{1}{2}O_2 = H_2O + SO_2 + 223{,}500 \text{ B.Th.U.} \quad \ldots\ldots (2)$$

Since this phase of the process is non-catalytic and is actually f voured by high temperatures, the energy evolved can be effectively used for the production of steam in simple equipment.

The flue gases leaving the boiler are cooled and are mixed with raw H_2S-containing gases. The mixture is then passed over bauxite catalyst for conversion to sulphur in accordance with the equation:—

$$2H_2S + SO_2 = 3S + 2H_2O + 62{,}000 \text{ B.Th.U.} \quad \ldots\ldots (3)$$

The heat removal problem in the catalytic reactor is thus reduced by a factor of three. Small-scale tests (where radiation is an important factor) have permitted operation at space velocities as high as 300 hr^{-1}, though industrial practice is roughly only one-half this amount.

(2) In the above method, one-third of the raw gas is burned in the waste-heat boiler while the remainder is introduced into the converters directly. The alternate method involves passage of the entire raw gas stream through the boiler and from there to the reactors, using the stoichiometric volume of air. This latter procedure which is of more recent origin has the advantage

that some 70 per cent of the total hydrogen sulphide is converted by thermal means, thus substantially reducing the burden on the converters.

One installation known to the author operated a single converter in accordance with method (1) described above. The sulphur efficiency of this installation was some 70 per cent. By after-cooling the effluent of the converter stage and passing it through a second bauxite-packed reactor, the yield was boosted to 85 per cent. Eventually, this plant switched to flow scheme (2) and was thus able to achieve a 93 per cent sulphur recovery. In more recent installations, operating according to scheme (2), efficiencies as high as 97 per cent are not unusual.

Catalytic Converter Temperature

Operating temperature in the catalytic converter ranges from 535-570°F. at the entrance to a maximum of 660°F. in the catalyst bed. The Claus reaction is reversible, and lower temperatures, while lengthening the required contact time, will raise the sulphur efficiency. Where yield considerations are a prime factor, it is therefore desirable to carry out the reaction in two stages with inter-cooling (often by direct water spray). Peak temperature in the second, 'clean-up' converter should not exceed 555°F.

In the waste heat boiler, on the other hand, burner temperatures run in the neighbourhood of 1,800°F. Medium pressure steam (200-250 p.s.i.) is generated at the rate of about 3,100 lb. per ton of sulphur recovered.

Special considerations in the design of the waste heat boiler are necessitated by the corrosive nature of the process gases. The simultaneous presence of small amounts of side-product SO_3 and of moisture raises the dew point well above 220°F. In order to eliminate the danger of condensing this corrosive phase, it becomes necessary to generate steam at no less than 75 p.s.i. (307.6°F.). At the same time, a favoured approach calls for the use of feed water which has been preheated to a minimum of 250°F. Maintaining the steam pressure below 250 p.s.i. permits economical use of the safer horizontal fire-tube boilers. Dead end lines (vent valves, explosion discs, etc.) may be protected from corrosive attack by the use of an air or nitrogen flush.

Catalytic converters constructed wholly of refractories are found primarily in European practice. The more recent American plants have preferred the use of steel shells, lined internally with suitable acid-resistant material. For instance, the Elks basin plant of the Stanolinf Oil and Gas Co. employs 16-ft. diameter reactors, lined internally with Lumnite. Here, a 6-ft. bed of catalyst is supported by 18/8 stainless steel grating and wire mesh. Incidentally, design space velocity at this plant is as high as 250 $hr.^{-1}$.

Design of the sulphur recovery system requires special consideration of the peculiar viscosity-temperature relationship of this element. From its melting point at *ca.* 240°F., the viscosity of sulphur drops gradually as the temperature is raised, until it reaches a minimum of about 40 c.p. at 320°F. From here, it rises rapidly to a non-pumpable 2,000 c.p. at 400°F. Care must therefore be taken to maintain the temperature of sulphur within the limits of 240 and 330°F.

After-cooling and sulphur condensation of the Claus reactor effluent may be carried out by the injection of a water stream into the gaseous stream. Care must be taken to prevent the formation of local water pools which would cause solidification of condensed sulphur and consequent obstruction of the gas passage. Cooled to 300°F., sulphur may be readily and efficiently recovered in cyclones for electrostatic precipitators.

A particularly useful and efficient method of sulphur recovery involves simultaneous cooling and washing by means of liquid sulphur in a packed tower. Cooling coils are provided in the base of the column to abstract the heat of condensation and gas cooling.

By means such as this, the petroleum industry will soon find itself in a position to cover more than its own sulphur requirements. It is thus turning from the position of a major sulphur consumer to that of an important supplier of this critical raw material.

MR. BRIAN H. TURPIN recently read a paper to the Society of Chemical Industry at King's College, London, on the subject of 'Glass Plant in Industry and Research'.

Among those taking part in the subsequent discussion were MR. J. F. WINDOW, of James A. Jobling, Ltd., and MR. J. McN. BRUCE, chemical engineer of Quickfit & Quartz, Ltd.

Additives & Residues Not Endangering Public Health

THERE is no evidence that consumption of foods resulting from the use of new chemicals in crop production or in the processing of foods has created mysterious diseases and epidemics or endangered the health of the people, the American National Research Council declared recently.

A carefully worded statement released by the Food Protection Committee states that these chemicals are essential in the production and processing of many crops. Panels of outstanding American scientists, nutritionists, government specialists, and industrial research directors based their report on a year's study of scientific data on the benefits and possible hazard of chemicals used in connection with foods.

'Contrary to some ideas that have been circulated, reliable food processers have not reduced the nutritional quality of our foods or created inferior products through the use of chemicals additives', the statement reads. It adds that the quality and sanitary characteristics of U.S.A. foods have been improving.

Recognising the challenge to increase and improve food production, the Committee adds: 'It is to the credit of industrial concerns and law-enforcing agencies that they have been able to make so much progress without jeopardising the health of the public'.

According to the statement, the contributions made by the chemical industries are not well understood by the public and the Committee issued it to acquaint the public with some of the basic facts regarding the use of chemicals in food, and the research and legal measures now being employed by industry and government to ensure protection of the public.

Types of Chemical Additives

Underlining the fact that all foods are simple or complex chemicals, the statement specifies the types of chemical additives used. Such materials as artificial colouring, synthetic flavours, sweeteners, vitamins for enriching bread, mould inhibitors, bactericides, and minerals are used for a specific need and termed 'intentional' additives. Other chemicals may be present in foods when they are marketed, such as pesticide residues, which may find their way into foods in very small quantities; these are known as incidental additives. They are avoided to a large extent by proper use of materials during the growing and processing of the crop.

Use of Chemicals in Food

Chemicals are added to food either to improve nutritional value, enhance quality and consumer acceptibility, preserve food, or make it more readily available to the public, the statement points out.

The enrichment of flour and bread with essential nutrients has improved the diet of the American people. The controlled addition of iodides to table salt to prevent goitre and fluorides to drinking water to help prevent tooth decay have long been advocated by responsible groups.

The statement lists as commonly unquestioned the addition of chemicals for improvement of foods, such as the fortification of evaporated milk with citrates and phosphates, the colouring of butter and margarine, and the standardisation of flavours possible with synthetic extracts. Protection of some foods against spoilage, rancidity, and moulding by the use of chemicals has long been an accepted procedure for conserving perishable food products, and therefore making them less costly. As long as they are never used as a substitute for good sanitary practice, chemical preservatives are useful.

The statement emphasises the inevitability of some unwanted chemicals turning up in minute amounts in foods. In the struggle to maintain and improve the nutritional status, the farmer has had to cope with hordes of insects, plant diseases, and rodents. Only by using a variety of pesticides can these ravages be held in check. Since some of these pesticides are known to be toxic to warm-blooded animals, their use has caused some concern. Modern agriculture, however, finds them indispensable, and they cannot be supplanted with organic farming, or by cultivation methods. Organic matter in the soil is valuable but does not guarantee against infestation, the statement says. 'Pests

must be controlled, or the food supply of the nation will decrease markedly in quantity and quality'. These facts make it plain that 'chemicals are destined to continue as much a part of farming as the tractor'.

There need be no hazards involved in the use of chemical additives in foods, provided adequate scientific research programmes are carried out prior to the use of an additive. The fact that a chemical is toxic does not mean *per se* that its proper use as an additive will entail a hazard to man.

The Committee recommends the development of a programme for the future by government and industry in view of the problems and the number of new chemical products that are being introduced.

1951 Nickel Production

Thirty per cent Increase Hoped For

THE free world's production of nickel for the full year of 1951 approximated 295,000,000 lb., an increase of more than 10 per cent over 1950, according to a review of the nickel industry by Dr. John F. Thompson, chairman and president of The International Nickel Company of Canada, Ltd.

Canadian producers, the review states, were responsible for 275,000,000 lb., or more than 90 per cent, of the free world's total this year. In 1950, Canada produced 247,000,000 lb. of nickel in all forms.

Reliable estimates of nickel production in Soviet Russia and satellite countries are not available, according to Dr. Thompson, but trade sources believe that the free world's total is several times greater than that behind the Iron Curtain.

'Measures to maintain this superiority in nickel supply', said Dr. Thompson, 'were taken during the year by established nickel producers as well as new potential producers, in a number of instances with government co-operation. These efforts will assure continuance of the amounts now available and are expected also by 1954 to provide an increase of approximately 30 per cent over that available before the Korean conflict.

'During the year producers and users of nickel continued to attack the task of nickel conservation. Their research, development and sales departments developed ways in which smaller quantities of the metal could be applied for the job at hand.

'Nickel is most generally used as an alloying element. The engineering alloy steels are a vital segment of both civilian and defence economies and are used for component parts of machinery and equipment. Production of these steels in the United States will be approximately 1,400,000 ingot tons higher this year (1951) than in 1950. Under the direction of government agencies, downgrading of alloy content has occurred in an effort to make more nickel available for jet engine alloys and other components necessary in a defence economy.

'Total production of all types of stainless steels in 1951 will be greater than in any previous year, with consumption of the chromium-nickel grades for military uses at a record high. The aircraft industries of the United States, Great Britain and Canada, with their developments of jet propulsion, are taking larger amounts of stainless steels of higher nickel content. Navy, Army and Atomic Energy Commission requirements for these steels for equipment and material have been heavy. In addition, the chemical and petroleum industries have been allowed large quantities for use in the expansion of defence-supporting facilities. Therefore, chromium grades have been substituted, where possible, for civilian applications in an effort to conserve nickel and this has been responsible for the increase in the total output of all varieties of stainless steels.

U.S. Radioactive Standards

TWO further radioactive standards, phosphorus 32 and iodine 131, bringing the total up to nine, have been added to those already distributed or calibrated by the U.S. National Bureau of Standards.

Early use of the radioactive isotopes of P^{32} and I^{131} in different laboratories showed widely varying results and it was principally to overcome this problem that the new standard solutions have been devised. They consist of a flame-sealed sterilised glass ampoule containing the active isotope in approximately three millilitres of dilute carrier solution. The exact disintegration rate per millilitre as of the zero date is noted and is roughly 100,000 disintegrations per second per millilitre (dps/ml.). The solution standards will be sold for $5.00 by the Radioactivity Section, National Bureau of Standards, Washington 25, D.C.

Soil Conservation Claims

Tests of Krilium Reported in U.S.A.

A SYNTHETIC soil conditioner, which it is claimed in America, may mark the beginning of a new era in agriculture, was revealed on 29 December by Dr. C. A. Hochwalt, chief of research of the Monsanto Chemical Company, in a paper delivered in Philadelphia before the American Association for the Advancement of Science.

Krilium, as the new synthetic chemical is called, will, it is claimed, in a matter of hours rejuvenate and sustain soil barren for years or generations.

Wide-Spread Tests

This plastic powder derived from acrylonitrile—a base or 'starting substance' for a number of plastics—was developed three years ago by Monsanto at its research laboratories in Dayton, Ohio. Its behaviour has been tested by chemists and soil scientists at the University of Ohio, University of McGill, the United States Departments of Agriculture, and various State Departments of Agriculture.

Krilium, it is emphasised, is not a fertiliser. Its action is similar to that of compost, manure or peat moss, in that it reconstitutes the physical structure of the soil to allow its natural nutrition through oxygen, water ,and other elements. It is claimed, however, that Krilium works from 100 to 1,000 times more quickly and powerfully than the natural conditions.

While natural humus-producing substances are destroyed within a matter of months by bacteria and must be constantly replenished, the new soil conditioner is stated so far to have been found resistant to decomposition by bacteria. It is also claimed that Krilium will not cake or crack soil treated with it and therefore cuts down erosion.

The ability of Krilium to reduce drastically the water run-off from eroded soil offers, it is thought, a possible cure for the annual fear of huge floods in the Missouri and Mississippi valleys.

Monsanto states that Krilium will be commercially available next year, and at first the cost is estimated will be about $2 a lb. The company is at present building a $50,000,000 factory at Texas City, Texas, to manufacture acrylonitrile.

Thermoplastic Tiles

'ESTIMATES indicate that during 1952, this new industry will manufacture 80 million square feet of tile', said Mr. L. H. Griffiths, technical manager of Semtex, Ltd., when he read a paper on 'Decorative Thermoplastic Floor Tiles' before the Road and Building Materials Group of the Society of Chemical Industry on 12 December. Details of the raw materials used (asbestos fibre, limestone filler, and resins) and the use and installation of thermoplastic tiles were outlined by Mr. Griffiths who said that production in 1952 would involve the use of 20 million pounds of resin binder and 32 million pounds of asbestos fibre. It was pointed out that the asbestos fibre used in the manufacture was a by-product until the tiles came into popularity.

Describing the process by which the tile ingredients were mixed, Mr. Griffiths said that a large mixer would deal with about 500 lb. of raw material in three minutes. It was largely the ease of mechanisation and the adaptability of the process to mass production, he added, which accounted for the low price of this product. The bulk of the cost of the tile was in the raw materials, and manufacturing and other costs were very small indeed.

To be Completed in 1952

A new factory for the British Oxygen Co., Ltd., is to be completed at Plymouth next year. This information was given by the chairman, Mr. S. J. Ham, at the annual dinner and social evening on the Thursday before Christmas of the company's Sports and Social Club, the function taking place at the Continental Hotel, Plymouth.

Reporting a year of increased activities Mr. Ham said the secret of success had been the co-operation between members and committee. He welcomed members, friends and guests from other branches, and said it was hoped that the club's activities would be further extended when the new factory for the company at Plymouth was completed during 1952.

Mr. F. Stephens, representing the medical section, acknowledged the co-operation and help his section had always received at the Plymouth office, and expressed the hope that the same spirit of fellowship would continue when they occupied the new premises.

Metallurgical Section

Corrosion of Buried Metals

Iron and Steel Institute hold Symposium

YEARLY cost of replacing corroded underground pipeline in this country is estimated at £50,000,000. This serious problem was discussed in London on 12 December last by 300 delegates at a Symposium on the Corrosion of Buried Metals, organised by the Iron and Steel Institute in conjunction with the British Iron and Steel Research Association and the Corrosion Group of the Society of Chemical Industry. Sir Charles Goodeve, F.R.S., was in the chair.

Opening the symposium, Sir Charles Goodeve said that all modern civilised communities were dependent on a number of services carried in the ground—water, gas, electricity and sewage being the chief. Water mains presented the greatest corrosion problems; some 100,000 miles were estimated to be under risk in this country in 1949, with another 25,000 miles of new mains under consideration.

Research Lagging

Research on the corrosion of buried metals had, however, lagged behind the advances in knowledge of methods of combating atmospheric corrosion, and the report of the Ministry of Health Departmental Committee on the 'Deterioration of Cast Iron and Spun Iron Pipes', published in 1950, had stressed the need for further research. BISRA's Sub-Committee on the Corrosion of Buried Metals had been formed in March, 1950, and was entrusted by the Minister of Health with the task of carrying out this research. One of its earliest actions had been to initiate the organisation of the symposium.

Dr. J. C. Hudson, head of the Corrosion Laboratory of BISRA, read a paper on the results of tests carried out on buried iron and steel pipes. Three sets of specimens had been buried in four kinds of soil and examined after five years' burial. From this it had been discovered that for bare pipes, the major factor in corrosion was the aggressiveness of the soil. A zinc coating of 2 oz. per foot protected the pipes except in a made-up ground of ashes, where corrosion was heavy. A ¼-in. bitumen coating on steel tube was almost perfect here, but a thin hot-dipped coal tar/pitch coating, 5 mil. thick, on cast-iron pipe, failed, similar results being obtained in Keuper Marl. Vitreous enamel on cast iron was in perfect condition on the latter site, but a stoved phenolic resin coating on steel failed because of its thinness.

Sulphate-Reducing Bacteria

In a paper on the sulphate-reducing bacteria which caused corrosion, Dr. W. H. J. Vernon said that studies of the bacteria had shown among many other things that selenates prevented sulphate reduction, and that this fact might be of help in protective coatings. This type of bacteria produced the most widespread and dangerous form of underground corrosion. Experiments at Chigwell with new pipes laid in 1945 had shown that after three years, a standard .005 in. hot-dipped coal tar enamel bath (the Angus Smith solution) did not stop the pipe from becoming badly graphitised. Bitumen sheathing ⅜ in. thick, however, gave adequate protection, as did surrounds of good quality concrete or gravel.

In the discussion which followed, the value of tests using only short lengths of pipe was criticised, and it was pointed out that pipelines with the opportunities that arise in them for concentration cells to form, face more severe types of corrosion than short lengths of pipe. It was also suggested that too much stress had been laid on bacterial corrosion and not enough on the cell mechanism that led to it. The importance of preventing rusting from starting was emphasised, and in this connection it was said that the mechanical fracture of coatings by stones, etc., was an important cause of initial corrosion. Surprise was expressed that no tests on cathodic protection had been performed at Chigwell. Alternative

coatings suggested included latex cement mixtures used in conjunction with hessian or glass cloth.

Buried Pipe Corrosion

Replying to the discussion, Dr. Vernon said that tests on lengths of piping were also undertaken on piping actually used in the field, as could be seen by the standard form issued for reporting buried pipe corrosion. Microbiological corrosion was not basically different from electro-chemical corrosion, but merely a special type, and he and his staff had taken every opportunity to point this out. However, most pipeline failures in this country showed unmistakable symptoms of microbiological influence. Cathodic protection tests had not been included at Chigwell, regrettably, as five years ago the method was not well-known and was even regarded with some suspicion. The Sub-Committee on corrosion was now concentrating on prevention of corrosion rather than the causes. In this connection, he emphasised, in the case of main-laying, care was vital in the transport and handling of pipes and in the back filling of trenches if damage to coating was to be avoided; the Report of the Departmental Committee of the Ministry of Health on the Deterioration of Cast Iron and Spun Iron Pipes published in 1950 contained much useful information on this subject.

Mr. K. A. Spencer, of Anglo-Iranian, in a paper on cathodic protection, said that this method of protection would, it was now generally appreciated, protect buried steel indefinitely. Corrosion was generally caused either by concentration cell effect, or the change in concentration of soluble salts in the soil along the length of a pipeline (the principal cause of corrosion in the Middle East); electrolytic cell effect caused by stray direct currents resulting in a variation of the potential of a pipeline relative to the soil; galvanic cell effect, caused by contact between dissimilar metals; and bacterial corrosion in anaerobic conditions (the chief cause of corrosion in the U.K.). Sulphate-reducing bacterial accelerated this by removing hydrogen on polarisation. In all cases, corrosion consisted of a positive current flowing from the metal to the electrolyte at the anode—the point of corrosion. Cathodic protection consisted of allowing sufficient current to flow into the metal surface from the electrolyte to stifle this flow from the anode, and could be achieved either by a higher potential scrap-metal groundbed anode supplied with an external direct current, or by expendable metal anodes (such as magnesium, zinc or aluminium) having a higher potential than steel. In this case current was produced as in a dry battery.

Mr. Spencer said that to ensure protection a current of between 1 and 15 amp./sq. ft. of exposed metal was needed, hence the need for good and continuous coatings, which were complementary to cathodic methods. The potential between metal and electrolyte had to be assessed, and this could conveniently be measured by a high resistance voltmeter with a copper/copper-sulphate half-cell. Natural potentials were usually from -0.35 to -0.70 V. It had been found that if more than -0.85 V. was maintained by application of cathodic protection, full protection was provided.

It was also necessary to survey the soil before applying cathodic protection; the most convenient method was to measure its electrical resistance. A broad designation was:—

Very corrosive	Less than 500 ohms/cc.
Corrosive	500-2,000 ohms/cc.
Mildly corrosive	2,500 ohms/cc.

Where soil resistivities were very high the potential developed by sacrificial anodes was not sufficient and the power-supplied system had to be used.

Mr. Spencer briefly described sacrificial and power-supplied installations, and quoted examples where considerable economies had been effected. Cathodic protection was finding increasing application to oil, gas and water lines, tank bottoms, jetties, water tanks, ships' hulls, process plant and buried power transmission lines.

Cathodic Protection

Mr. Spencer then introduced Monsieur de Brouwer's paper 'Cathodic Protection of Buried Metal Structures'. (Monsieur de Brouwer is the technical manager of the Societe de Distribution du Gaz, Brussels). The paper dealt with cathodic protection by 'polarised drainage' and 'forced drainage'. These methods had been extensively used on the Continent, where there were many tramways and railway lines using direct current, the presence of which complicated the practical installation of cathodic protection.

'Polarised drainage' consisted of the

neutralisation of anodic areas caused by stray currents leaving the structure, by connecting the pipeline to the return circuits of the electrical traction lines from which the stray currents originated.

The drainage apparatus had to be large enough to resist inverse potentials of the order of a score of volts and to allow the flow of several hundreds of ampères without producing large potential drops.

'Forced drainage' was applied where the potential of the rail did not constitute a sufficient source of current, and it was not necessary to insert in the electrical circuit a supplementary source of e.m.f. Practical applications of both methods were described in both papers.

In the discussion which followed, Dr. A. J. Maurin, of Gaz de France, Paris, said that nomograms had been constructed in France for the calculation of specific aggressiveness of soil from characteristics which could easily be measured. No main was laid in France to-day without both the specific and the apparent aggressiveness of the soil being measured. Some 600 kilometres of new mains were being protected every year, and the authorities were considering the use of ultrasonics to combat the sulphate-reducing bacteria.

The importance of measuring potential in assessing the corrosion danger was stressed, and it was also pointed out that the necessary cathodic potential 'drifted' with time due to polarisation, and actually the current required tended to become less.

Post Office Cables

Details of Post Office cables were given, and a description given of a cathodic protection installation on jetty piling in the Persian Gulf. A query was raised that cathodic protection might alter the physical properties of the metal it was designed to protect so that it wore away more quickly than it would otherwise, and it was pointed out that this alteration of physical properties might lead to premature failure of a ferrous part in a machine because it happened to be fortuitously cathodically protected.

The paper contributed by the British Electrical and Allied Industries Research Association on 'Corrosion of Buried Copper and Ferrous Strip in Natural and Salted Soils' was introduced by Dr. G. Mole. It described an investigation to determine the relative corrodibility in different soils of metals used for earth electrodes. Over a period of 12 years the behaviour of cast iron, Armco iron, mild steel, galvanised mild steel, copper and tinned copper in twelve soils were investigated. As the soil surrounding electrodes is often salted as an anti-corrosion precaution, salted and unsalted soils were used at each site.

Tinned Copper Resistance

It was found that tinned copper was the most corrosion-resistant, usually losing by corrosion less than 0.1 per cent per year, compared with nearly 2 per cent for unprotected ferrous specimens. Galvanising, however, gave mild steel considerable protection, which lasted at least twelve years. Salting generally increased the corrosivity of the soils.

'Tests on the Corrosion of Buried Aluminium, Copper and Lead' by P. T. Gilbert and F. C. Porter was introduced by Mr. Porter. He described tests on tubes of commercial-purity aluminium, phosphorus-deoxidised arsenical copper, and lead, buried at the same time and on the same sites as the ferrous specimens referred to in the first paper. As iron and steel pipes were most commonly used for mains and non-ferrous metal pipes for supply lines, the two investigations were deliberately undertaken in parallel.

The aluminium was severely pitted after five years in all soils except the moist neutral clay, where there was virtually no attack. Cinders caused severe attack on copper and in the other four soils the attack varied from practically nothing to a moderate localised attack up to about 0.2 mm. deep (about 10 per cent of the wall thickness of a 16 S.W.G. pipe) in five years. Lead was unattacked in one soil and moderately attacked in the other four with maximum depths of attack between 0.3 and 1.0 mm. (7-15 per cent of a ¼ in. wall thickness) in five years. Lead behaved comparatively well in the cinders. It was worth remarking that they had encountered variation of corrosivity along the length of the trench by a factor of two.

In the discussion which followed it was suggested that the sulphate and chloride explanation of the breakdown of the protective oxide film on aluminium was insufficient and that further attention should be paid to copper contamination. Suggestions that tanks had been found to be protected by

surrounding them with 6 in. of puddled clay were thought by the same speaker possibly to be applicable to aluminium, especially if the clay was puddled over the bitumen/barium chromate type of protective coating.

One speaker thought that, from the weight loss figures quoted in the paper, the order of merit in which tinned copper appeared to be superior to bare copper might be misleading, particularly if the results were too widely interpreted. No assessment of pitting has been made, and he doubted whether one could accept the general usefulness of tinned copper for underground use in spite of the good showing in the test. He would not like to see tinned copper pipes used underground. He queried the general usefulness of the tests for the particular application under discussion since the work had not involved the application of impressed current to the specimens.

Another speaker suggested that aluminium might not be trustworthy in anaerobic conditions. When immersed in distilled water, boiled and sealed with paraffin, the aluminium gave off hydrogen after four weeks and began to corrode. The access of oxygen would appear to be an important factor.

When tested similarly in a nitrate solution, the aluminium specimens after a period of a few days to a few weeks began to dissolve very rapidly, the nitrate having turned to ammonia. Could this not happen when aluminium was buried in soil?

Replying, Dr. G. Mole agreed that care should be exercised in applying his results to pipes since pitting was of no significance in earthing strip and had therefore been disregarded in these investigations.

Dr. Gilbert, replying, said that the suggestion of further investigation of copper contamination in the electrolyte when alumnium corroded would be pursued. The presence of chloride and sulphates was not necessarily detrimental, but breakdown would be more rapid in the presence of chloride.

Duisburg Copper Works

75 Years' Smelting Celebrated

ON 1 November last, the Duisburg Kupferhütte celebrated its 75th anniversary. This veteran copper mine started in 1876, when ten West German manufacturers of sulphuric acid combined to establish a plant for roasting and working up pyritic residues after the sulphur had been removed. These residues contained up to 55 per cent iron, some copper and zinc, and small amounts of lead, cobalt, silver, and gold, with traces of other elements. At first attention was directed only to recovery of iron and copper, but was soon extended to the other products.

The Duisburg site possessed many advantages for the growing enterprise, including adequate water supplies—of which vast quantities are used in the various processes—fuel, rocksalt, and good transport. There were, however, many initial and subsequent difficulties: metal prices fell, especially for copper, and labour and other costs increased. Eventually economic methods were worked out for recovering all valuable by-products, even, in some cases, where only traces or little more existed. After iron and copper, these included zinc, sodium sulphate, lead, cobalt, gold, silver, and, most recently, also cadmium and thallium. In addition there are also metal salts and beneficiation products to be had.

Increase Tenfold

Whereas formerly only about 100,000 tons of raw material per annum was worked up, to-day the amount exceeds 1,000,000 tons per annum. And this is not the limit, for it is only by working on the largest possible scale that some of the processes, at all events, can be established on an economic footing. Extension of the works area to over 100 acres (425,000 m.^{2}) is therefore planned. Briefly, the main process consists of mixing the pyritic residue with common salt, grinding it rather fine, and then roasting the mixture in furnaces up to 600°C. The product is then subjected to a complicated series of washings or other similar treatment for recovery of the various products, including electrolytic refining (for copper) and vacuum cooling (for sodium sulphate). Part of the copper lyes are worked up directly to copper salts for use in the artificial silk and insecticide industries. In addition to the details given above (from *Deutsche Farben-Zeit,* 1951, **5** (12), 438-440, December) some account is also given of the special system of copartnership with the workers that has been introduced, and to which much of the successful progress of the past few years is attributed.

Cobalt Production from Roast Pyrites

German Methods and Output

PROBLEMS of cobalt production from pyrites, Germany's contribution to world output by this method, and a brief survey of some of the more important contributions to the literature on the subject were recently given in an article by Dr. K. Horalek.

The largest German producer of cobalt from pyrites is the Duisburg Kupferhütte and publication of the doctor's paper marked the celebration in November last of the firm's 75th anniversary (*Angew. Chem.*, 1951, **63** (22), 525-527).

By way of introduction the author gave some totals of world production from cobaltous ores, of which the Belgian Congo was the largest supplier. For the 10 years ended 1947 world output of the metal was 42,400 tons, or an average of 4,240 tons a year with a tendency towards 5,000 tons. In 1947 the three main producers were Belgian Congo 3,500 tons, Northern Rhodesia 420 tons and French Morocco 320 tons.

The Duisburg firm had been engaged in producing cobalt as a by-product from roast pyrites for the past 25 years. Owing to the great scarcity of non-ferrous metals after the first World War, especially zinc, the company was induced to consider seriously the use of hitherto waste material for recovery of zinc and possibly cobalt. The Swedish Ramen or Orkla process was adopted and considerably improved. By about 1927 when zinc recovery was established on a large scale attention was given also to cobalt.

Variations in Metal Content

Percentage metal content of roast pyrites from various sources, the highest for CO being from Finland, followed next by Norway and Cyprus, were given as:—

	Fe	Cu	Zn	Pb	Co
Outukumpu (Finland)	58.75	0.44	1.54	0.02	0.5229
Cyprus	57.20	4.00	0.78	0.075	0.1300
Orkla (Norway) ..	47.85	2.45	2.43	0.12	0.0887
Tharsis (Spain) ..	60.00	1.10	2.69	0.73	0.0357
Rio Tinto (Spain)	58.00	1.10	2.86	1.06	0.0260
Meggen (Germany)	41.65	0.07	8.80	0.50	0.0096
Mixture	49.60	0.80	2.53	0.50	0.0479

After removal of copper the material was cooled for recovery of sulphur in the form of Glauber's salt (decahydrated sodium sulphate) and was transferred to the zinc recovery plant where first iron then cobalt and finally zinc were precipitated out. The first two, after preliminary oxidation, were obtained in the trivalent form. The Co^{III} hydrate containing in dry substance about 22 per cent Co, 9 per cent Zn, and 8 per cent Mn was washed, dissolved, and after purifying the solution—removing Fe, Cu and SO_4 ions, it was again precipitated with lime.

Converting the Hydrate

The mixed hydrate of Co-Mn-Zn was converted by heating into a mixed oxide and further treated in an electric oven. First of all by selective reduction (melting out) the Zn was vaporised and most of the Mn converted to slag. The remaining Mn and Fe were almost entirely eliminated (or recovered) by melting and oxidising, and sulphur removed by carbide treatment. The cobalt finally obtained contained less than 0.2 per cent Cu, 0.03 per cent C, 0.05 per cent S, and from 0.5 to 2 per cent Fe.

This method differed from that usually employed more especially in that a perfectly pure cobalt melt was not primarily obtained, from which pure cobalt oxide was yielded; but an electro-thermal process was adopted to separate out the Mn and Zn, in a later stage of which the Co metal appeared as a melt. It was thus necessary to use a form of casting mould different from the usual rondel, or small cylinder of about 1 cm. diameter and height formed by pressing a mixture of pure cobalt oxide and reducing agent at temperature below m.p. of the metal.

After many tests the form ultimately selected was that of a small sand-cast cone of about 400 g. in weight. The metal was also produced in granular form by immersion in a water current. The arc furnace used in obtaining the metal differed from the ordinary Heroult type in having a special attachment for exhaust of zinc vapours.

Production of cobalt at Duisburg from this source in 1937-8 was about 160 tons, falling to about 50 tons in 1940; and after a fluctuating rise to 125 tons in 1943 it fell to zero in 1945. In 1948-49 there was marked recovery so that by 1950 it reached nearly 300 tons. Although this amount

might still be relatively small compared with the world's total Dr. Horalek claimed that it certainly affected the Belgian-Canadian monopoly mainly controlled by the Union Minière du Haut Katanga and the Deloro Smelting & Refining Co.

It was, of course, supremely important to Germany. In fact, as long ago as December, 1928, an agreement had been arrived at with the Belgo-Canadian firms that Duisburg should supply the German and Austrian cobalt requirements.

Some of the more important contributions to the literature relating to cobalt production (listed at the end of this article) were then reviewed by the author.

Developments Described

In a French work by R. Perrault[5] it was pointed out that a few years before the last war a new source for cobalt had been found in various types of pyrites, such as those of Outukumpu in Finland and also in Germany. In his monograph R. S. Young[6] went over similar ground and described developments too in the U.S.A., by the Bethlehem Steel Co., at Cornwall, Pa., where the magnetic iron ore contained a certain amount of cobalt-bearing pyrites; although the Co content was less than 0.05 per cent.

This was first divided into magnetic and non-magnetic concentrates, the latter amounting to about 36 per cent of the whole and containing 5.6 per cent pyrites with 0.086 per cent Co. By selective flotation a cupriferous and a pyritic concentrate were obtained, the latter with 88.7 per cent pyrites and 1.39 per cent Co. After burning out the sulphur the material was treated by the Pyrites Co. of Wilmington for cobalt production.

The method used was very similar to that of the Duisburg Company, and began with chlorination and roasting with addition of common salt and then leaching with water. The lye contained 30 g. Co, 15 g. Cu, and 0.3 g. Fe/litre. The Cu was mostly removed for further special treatment, and the remaining Cu, together with the Fe and Mn, were precipitated by soda and chlorine under controlled *p*H. The Co was precipitated as hydrate, with Zn and Ni remaining in solution. The hydrate was heated, foreign salts washed out, and the product calcined to form the commercial oxide, or reduced to metal with wood charcoal. This method with slight variations is also described by J. V. Beall[7]. In 1949 the Bethlehem Steel Co. produced about 300 tons.

In Japan during the second world war cobalt was produced from pyritic sources, according to a report by S. Nakabe[8]. The material was a pyritic concentrate of the cupriferous type from the Besshie mine flotation plant, and contained 0.10 per cent Co, together with 0.32 per cent Cu, 41.52 per cent Fe and 45.05 per cent S. Nakabe stated that it was necessary to evolve a new process as the literature gave no methods for obtaining Co from cupriferous pyrites. Research began in 1939, a test plant was built two years later, and a larger plant started up in 1943. Up to 1945 about seven tons of Co metal was yielded from about 37,000 tons roast ore.

Under this process, chlorination was dispensed with. In oxidising and heating, air supply and temperature had, of course, to be strictly controlled to avoid ferrite formation, and cobalt sulphate was formed almost up to maximum possible yield, simultaneous solution of iron being avoided to utmost extent. The lyes contained per litre: 0.2-0.3 g. Co, 0.5-1.5 g. Cu, 0.3-1.5 g. Fe, 0.3-0.6 g. Zn, and 0.1-0.2 g. Mn.

Iron and copper were removed in two stages: (a) with deficient soda to give a cobalt-poor precipitate to be further treated for copper; (b) with excess soda to yield a cobaltous precipitate. The Co was finally obtained as hydrate by treatment with soda and chlorine with Mn and Zn as principal impurities. The hydrate with 30-35 per cent Co was dried, and finally converted to a metallic melt in an electric arc furnace similar to that used in the Duisburg plant. The cast plates thus obtained were electrolysed in a sulphate electrolyte.

Electro-Thermal Refining

Why both the German and Japanese methods employed electro-thermal refining, thus differing from the American process, was, as Dr. Horalek explained, due to the difference in composition of the respective cobaltous crude lyes. In the former, Co content was very small, and purification to remove preponderant impurities such as Zn and Mn was not economically feasible, since these two elements closely resembled cobalt in chemical properties. The melt method was much better. By the American process, on the other hand, Co content was relatively

high and a fairly pure hydrate could be directly obtained from the lyes.

The paper concluded with a reference to two German contributions to the literature, which dealt in some detail with the Duisburg process[9, 10].

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Japanese Titanium

New Reduction Process

THE iron sands of Japan contain high percentages of titanium, and a new process developed by a Japanese chemical engineer is believed there to be capable of producing the metal at a cost of less than 7s. per lb., if it is run on a big enough scale. The process consists, briefly, of reducing the iron sand in an electric furnace, to produce charcoal pig-iron and titanium-bearing slag; chlorination of the slag, to give titanium tetrachloride; purification of the tetrachloride; and finally reduction with magnesium and vacuum distillation to give titanium metal. Laboratory analyses of the product give it a 99.5 per cent purity. For many years the company has been producing charcoal pig-iron from iron sand by electric furnace, and a pilot plant for treatment of the resultant slag will go up within the framework of the present company. Estimated costs of production on a 3-ton operation are calculated at roughly £1 per lb.

The industrial plant, to be operated under a new company, is planned to have an initial output of 10 tons per month with a later expansion to 30 tons, costs then being calculated to be approximately 15s. per lb. Eventually the company hope that production will exceed 30 tons per month. The installation of a power supply owned by the company would probably reduce the cost of the metal to below 7s. per lb., it is reported.

Uranium Search Begun

British Explore Uncharted Territory

ON New Year's Day a British expedition left Freetown on a geological exploration of Sierra Leone and the Gold Coast to discover whether the radioactive elements uranium and thorium, essential for atomic energy projects, exist in that territory. It is to be the first geological survey of jungle and bush country there.

The expedition is using a new type of Geiger Counter detecting equipment, mounted in Land Rover vehicles, which will automatically record the presence of these elements in the subsoil of the country through which it is driven and will also show whether the quantities are significant.

Minute amounts of uranium and thorium are present in all rocks and soils, the content varying with the type of geological formation. Since the new instrument detects even the ordinary small variations, it is expected to become a useful tool for making geological maps.

If workable uranium deposits exist within the country traversed, they should readily be discovered by means of this technique.

The party is being led by Mr. Dennis Ostle, a senior geologist of the British Geological Survey (Department of Scientific and Industrial Research). He is accompanied by Mr. F. H. Hale, an electronics expert of the Atomic Energy Research Establishment of the Ministry of Supply. Officers of the Sierra Leone and Gold Coast Geological Surveys are collaborating in the research.

As the expedition will be using territory where there are no normal roads the detecting equipment will have freer scope. It consists of eight tubes, each about 2 ft. 6 in. long, with an automatic recording mechanism with an additional buzzer 'alarm' system should a strong deposit be found.

Italian Aluminium Polisher

A new process for the chemical polishing of aluminium is reported from the Light Metal Experimental Institute, Milan. The process is based on the simultaneous action of phosphoric acid and a mixture of acid salts of alkaline metals and alkaline earths. Called 'Alubril II', the process is unique because the acid bath does not attack the steel containers in which it is used, and the polished pieces do not have to be immersed in a nitric acid bath after treatment.

New Year Metal Allocations

IMC Distribution of Copper, Zinc, Tungsten & Molybdenum

ALLOCATIONS for the first quarter of 1952 of some of the metals in short supply have now been announced by the International Materials Conference in Washington.

Recommendations of the Copper-Zinc-Lead Committee have been accepted by the governments of the 12 countries represented, namely: Australia, Belgium (on behalf of Benelux), Canada, Chile, France, the Federal Republic of Germany, Italy, Mexico, Norway, Peru, the U.K. and the U.S.A. Requirements of non-member countries were taken into consideration.

Only primary copper and zinc have been allocated. Semi-fabricated products are to be maintained at a level commensurate with the exporting country's allocations of metal. Except that no provision has been made for increasing strategic stocks the total estimated supply available has been allocated in general, on the same basis as for the last three months of 1951.

Chile Agrees

The Chilean Government agreed to the recommendations of the committee with regard to 80 per cent of the copper production of its large mines, but for the remaining 20 per cent and the production of its small and medium mines it reserves the right to dispose of this tonnage without reference to the allocation scheme.

Lead is not at present recommended for allocation, but the question of supply and demand is being kept under review.

Largest shares (in metric tons) go to the U.S.A. with 366,000 copper and 229,000 zinc and the U.K. with 100,000 copper and 64,000 zinc.

The scheme proposed by the Tungsten-Molybdenum Committee of the IMC has been accepted by the governments of its 13 members, namely: Australia, Bolivia, Brazil, Canada, Chile, France, the Federal Republic of Germany, Japan, Portugal, Spain, Sweden, the U.K. and the U.S.A.

This is the third consecutive quarter that these two metals have been allocated by the IMC. Great pressure on available supplies of both tungsten and molybdenum continues. Nevertheless, the committee was glad to note that the production of both commodities, especially of tungsten, had increased considerably. Along with these increases, however, the total requirements for defence and essential civilian needs had also increased, and estimated requirements still greatly exceed estimated production.

For the first calendar quarter of 1952, total production of tungsten in the Free World is estimated at 3,700 metric tons, and of molybdenum at 4,800 metric tons (metal content in each case).

The committee has not yet had time to study fully the replies received from governments to its questionnaire on their requirements of tungsten and molybdenum in the first two quarters of 1952. The present plan of distribution is, therefore, provisional for the first quarter only and it is recommended that a firm six months' plan of distribution for both metals be adopted not later than 1 March, 1952, into which the present provisional allocation would be merged.

When making this latest allocation, the committee distributed tungsten ores and concentrates on the same basis as it did for the fourth quarter of 1951, with an increase of $12\frac{1}{2}$ per cent in the quota for each country, and with the creation of a reserve of about 62 tons for emergency and other needs.

Molybdenum Plan the Same

In the case of molybdenum, the plan of distribution is identical, so far as concerns the ores and concentrates retained by each country for its own consumption. Certain changes have been made in the quotas of primary products allotted, and a reserve has been created of about 40 tons for emergency claims and other needs.

While carrying out the allocations agreed upon, the governments, both of the producing and of the consuming countries, are expected to continue to take upon themselves the obligation of taking whatever action is necessary to render the agreed quotas effective.

Existing contracts will be respected so far as is possible in carrying out the allocation arrangements.

Canada's Mineral Industry

Progress in 1949 Reviewed

RECORDS both in the volume and value of Canada's mineral production are recorded in the report on 'The Canadian Mineral Industry in 1949' (No. 830, 25 cents), recently published by the Mines Branch, Canada Department of Mines and Technical Surveys.

The report contains reviews of the 57 metals, fuels and minerals produced in commercial quantities in 1949 and is divided into two sections, metals and industrial minerals.

Quantity records were attained in outputs of iron ore, coal, natural gas, crude petroleum, cement, fluorspar, nepheline, syenite, salt, and stone. The value of mineral production amounted to $901,010,026, a gain of nearly $81,000,000 over 1948, the previous peak year.

Attention throughout the year continued to be centred largely on developments in the oil fields of Alberta where active exploration led to further important discoveries of petroleum and at the same time additional large reserves of natural gas, bringing the estimated total to seven trillion cu. ft. by the end of the year.

Production of crude oil from the province reached an average daily rate of 55,000 barrels compared with a daily average of 29,750 barrels in 1948. Early in the year a company was formed to construct a pipeline from Edmonton to Superior, Wisconsin, with the intention of commencing the work early in 1950.

Titanium Ore Deposits

The large deposits of titanium ore at Allard Lake in Quebec were brought nearer to the producing stage. Work was under way on the 27-mile railway to connect the deposits with Havre St. Pierre, and on the construction of an electric smelting plant at Sorel, Quebec, to treat the ore.

A further outstanding development was the opening up of a new and important asbestos area in Munro township, Quebec. Several deposits of the mineral were delimited by the end of 1949 and a 100-ton-an-hour mill to treat the ore was under construction.

Production of nickel, copper, lead, and zinc reached a peacetime total of 840,184 tons, being about 150,000 tons short of the peak reached in 1942. Exports of the four metals totalled 700,000 tons, valued at $257,400,000. Of this tonnage 60 per cent was exported to the U.S.A. and about 30 per cent to Great Britain.

Aluminium production in Canada in 1949 was 369,466 short tons, the largest peacetime output on record. Production would have been even larger but for a shortage of water for power-generating purposes which, early in the year, necessitated closing some of the pot lines. All the output was from imported ore.

Nickel Output Large

Over three-quarters of the world's nickel is supplied by the Sudbury area of Ontario. Canadian output for 1949 reached 128,690 tons which was slightly less than the record of the previous year, but the value was greater because of a small rise in price. The seven mines of the Sudbury area are the only Canadian producers of nickel, with the exception of a small amount from silver-cobalt ore.

As the market for nickel is expanding steadily, an active search for fresh deposits has been in progress for some years. So far the only new economic project was a mine now being developed at Lynn Lake, in northern Manitoba.

Ore from the company's mines was treated by flotation in a large concentrator at Copper Cliff, with the exception of a comparatively small tonnage of lump ore that was melted to matte in blast-furnaces at Coniston, largely for the production of Monel metal.

A new plant was under construction at Copper Cliff that would supersede the roasters and reverberatories and would conserve the sulphur now wasted. The copper and nickel-rich concentrates would be flash-roasted in oxygen to give molten matte and concentrated sulphur dioxide gas. The gas would be compressed to the liquid state and in this form could be shipped economically for long distances to existing markets.

Canada is credited with about half the annual world supply of platinum metals. Production in 1949 amounted to 336,017 oz. an increase of over 25 per cent over the previous year's output.

Selenium and tellurium were combined for

purposes of the report as they are closely associated and both were produced in Canada as by-products of copper refining at the same plants. The Montreal East refinery, with an annual rated capacity of 450,000 lb. selenium is the largest plant of its kind in the world.

Selenium is used as an antioxidant in lubricating oil; for fat hardening; as a catalyst in the petroleum industry; in the hydrogenation of coal; for treating skin diseases; and for making certain inks and insecticides. Selenium dioxide is used to make a number of selenium compounds, particularly accelerators for vulcanising rubber.

Uses of Tellurium

Tellurium is used to improve the durability of rubber; to increase the hardness of metals; in zinc refining; in the ceramic and glass industries, where it imparts a bluish to brownish effect in the products; and in toning silver prints.

No tungsten ore or concentrates were produced in Canada in 1949. Production of refined zinc and of zinc contained in concentrates for export was higher than in 1948 and a record output value was reached for the third year in succession.

Diatomite, which is used for filtration purposes in sugar refining, liquor distilling, syrup making, and in the chemical, rubber soap, and textile industries, was only produced in small quantities, far short of the Dominion's requirements although there are more than 400 known occurrences.

All the pyrites produced in Canada was obtained as a by-product from the concentration of base metal sulphide ores and none was mined as a primary material. Sulphur content of these pyrites concentrates ranged from 47 to 50 per cent.

Native sulphur is not known to occur in commercial quantities in Canada. In the past it was produced from smelter gases by the Consolidated Mining and Smelting Company, but lately all the sulphur in the gases has been required by the company to make sulphuric acid for use in the manufacture of fertilisers.

Large-scale experimental work on the production of sulphur and iron from pyrites was continued by the Noranda Mines, Ltd. Sufficient pyrites is available in the Noranda district to permit of the production of 200,000 tons of sulphur annually for many years.

The natural gas available in southern Alberta, some of which contains nearly nine per cent of hydrogen sulphide, is another large potential source of sulphur. Efforts are being made to develop a process to recover elemental sulphur from this gas.

Deposits of anhydrite and gypsum in Nova Scotia and New Brunswick, and elsewhere in Canada, constitute a huge potential source of sulphur and its compounds. The adaptation of a process in successful operation in Germany, England, and France that produces sulphuric acid and portland cement from anhydrite or gypsum and clay is being investigated in New Brunswick.

Leeds University Grants

FURTHER grants and donations received by the University of Leeds, announced at a meeting of the Court held on 19 December, included the following:—

Imperial Chemical Industries, Ltd.: £250 for research in the Department of Biomolecular Structure; £250 for research in the Department of Colour Chemistry and Dyeing; £250 for research in X-ray structure analysis. The Geigy Co., Ltd., of Manchester, £200 a year for seven years for research in the Department of Colour Chemistry and Dyeing. Gas Council, £400 a year to support research into the biochemical aspects of sewage, for the Department of Biochemistry.

Wellcome Research Institute, £750 a year for two years for the Department of Pharmacology. Medical Research Council, £1,150 a year for salary of research assistant and equipment for the Department of Physics.

To Discuss Eelworms

There will be a meeting of the Crop Protection Panel of the Agriculture Group of the Society of Chemical Industry on 8 January. It will be held in the Rooms of the Chemical Society, Burlington House, London, W.1, at 5.30 p.m. Contributions to the 'Eelworm Problem' will be given by Dr. B. G. Peters (Rothamsted Experimental Station), Dr. A. W. Johnson (University Chemical Laboratory, Cambridge) and Dr. W. Heeley (Shell Chemicals).

OVERSEAS

U.S. Product Manufactured in S.A.

Chemical Services (Pty.), Ltd., Johannesburg, which also has a factory in Durban, is now manufacturing Erusto products under licence from the Pennsalt International Corporation of Philadelphia. Some of the products for which special plant has been installed at the Durban works are: 'Erusticator' for rust removal and abolishing deeply embedded stains, an oil and grease remover, and a filter soap.

Chemical By-products from Steel Works

A number of chemical by-products will soon be being obtained from the new steel works at Vanderbijl Park. A benzole recovery plant will provide for the production of crude benzole and its derivatives. Equipment will also include a continuous type tar distillation unit capable of handling 100 tons of crude tar daily, and a naphthalene oil crystallising plant.

Sulphur Concentrates Mined

A large surface deposit of sulphur concentrates near Cody, Wyoming, belonging to the Wyoming Gulf Sulphur Corporation is being mined at the rate of 35 tons per day at present, it is reported. On the basis of the first two weeks' operation the corporation estimate that they will be able to produce pure sulphur at a cost of about $12 per ton. The 1,800-acre property contains an estimated 7,000,000 tons of ore.

Drug Alleviates Sweating

People suffering from 'hyperhydrosis' or excessive sweating, may be able to find temporary relief from this embarrassing condition with a new drug called 'banthine bromide', according to Dr. A. G. Zupko, of the St. Louis College of Pharmacy and Allied Sciences, in a report to the American Pharmaceutical Association (Scientific Section) recently. The drug is stated to have controlled the excessive sweating of 44 volunteer patients. Previously banthine was used for peptic ulcer. Mild and pronounced cases of sweating were relieved by 100 and 150 mg. per day, but with severe cases even 200 mg. per day had no effect. Side effects, although slight, were found to be constipation, heartburn and headache. The drug is, of course, only a palliative and not a cure.

Chloromycetin Gift

The Italian distributors for Parke Davis & Co. have given 1,000 vials of chloromycetin (12,000 capsules) to health authorities in Rome for use in flood-stricken Sicily, Sardinia and Calabria. The company gave 10,000 doses of the drug to Jamaica in August to help fight the hurricane, and another 5,000 to earthquake-stricken El Salvador last May.

Conditions Reasonable

Reporting on the supply position of chemicals in Canada the Toronto Purchasing Agents' Association states that the position is reasonably good. Ethylene oxide and ethylene glycol remain in short supply. Chlorine has eased somewhat but is still fairly difficult to obtain. Caustic soda is once again in good supply as are the prominent coal chemicals, such as benzole, toluol and xylol. The supply of phosphates is good, as well as such items as carbon tetrachloride and other chlorinated solvents. Perchloroethylene and trichloroethylene. The sulphur groups remain tight and may deteriorate further.

New Research Laboratory

As a further move in the expansion of its chemical research programme in Canada, Monsanto Canada, Ltd., has completed arrangements for the erection of a new research laboratory and pilot plant on its Ville LaSalle site. Construction is scheduled to begin within the next few weeks on the structure which, when completed, will more than double the company's research facilities. Costs of the building and equipment have been estimated at $400,000.

To Grow Pyrethrum

The pyrethrum flower, which is grown mainly in Kenya, is shortly to be cultivated in Australia. It is believed that within five years Australia could become a major supplier of pyrethrum which was found to be particularly effective against malarial mosquitoes, typhus ticks, and other disease-carrying insects in the Pacific during the second world war.

World price for top-quality pyrethrum is about £A1,000 ($2,250) a ton. In Kenya the flowers are plucked by hand, but Australia has developed a machine to do this work.

• HOME •

Change of Address

The British Sulphate of Ammonia Federation, Ltd., announces that as from 1 January, its registered office was transferred to: Thornycroft House (South Block), Smith Square, London, S.W.1. (Telephone: VICtoria 1953-4-5), to which all correspondence formerly directed to the secretarial and accounts department should now be addressed.

Titanium Pigments

Owing to the rising costs of raw materials, transport and wages National Titanium Pigments announces that as from 1 January it has been compelled to make the following increases in price in its range of titanium pigments. Anatase type, 'Tiona' titanium oxide grades G., F.P., S. and W.D. each raised by £10 a ton; 'Tiona' 70 titanium white £7 a ton; 'Tiona' 50 titanium white, £5 a ton; 'Tiona' 25 titanium white, £2 10s. a ton; 'Tocarba' 25 titanium pigment, £4 a ton. Rutile type: 'Runa' rutile type titanium oxide, grade R.G. increased by £10 a ton. All other conditions of sale remain unchanged.

Sulphuric Acid Production

In our issue of 24 November, we referred to the production of chamber and contact sulphuric acid and oleum in the United Kingdom in the quarter ended 30 September as having reached a total of 514,600 tons compared with 442,968 tons in the corresponding period last year. This should have read 402,666 tons compared with 442,968.

Metal Finishing Report

A discussion of the Anglo-American Productivity Team Report on Metal Finishing will take place at the January meeting of the Institute of Metal Finishing (London Centre), to be held at the Northampton Polytechnic Institute, St. John Street, Clerkenwell, London, E.C.1, at 6 p.m., on 21 January. A substantial proportion of the team will be present to answer questions, and samples brought from the U.S.A. will be displayed. The Society is particularly anxious to encourage the attendance of people interested in paint finishing as well as electroplating.

Iron and Steel Scrap Prices

Increases in the controlled maximum delivered prices of iron and steel scrap as from 31 December were announced last week by the Minister of Supply (Mr. Duncan Sandys). The increases, which vary according to district and specifications, vary from 1s. 8d. to 3s. 6d. a ton and reflect the rise in railway freight charges. The Order is the Iron and Steel Scrap (No. 5) Order, 1951 (S.I. 1951, No. 2268).

Virgin Aluminium Price

The Ministry of Materials has announced that from Tuesday, 1 January, 1952, the price of virgin aluminium in ingot form has been increased from £124 to £148 per long ton delivered into consumers' works. For metal in notch bar form there will be an addition of £2 10s. a ton as at present.

The new price will apply to metal of a purity of 99 per cent to 99.5 per cent inclusive. The premiums to be paid for higher purities will be reduced to the following:—

Purity		*Premium per ton additional to ingot or notch bar price*
Minimum	99.6%	£2
,,	99.7%	£4
,,	99.8%	£8

The change in price is due to the increased cost to the Ministry of imported supplies and of distribution.

Extension to Plant

Workers from the Stone and King's Norton (Birmingham) factories of Quickfit & Quartz, Ltd., will be among guests of honour when Sir Graham Cunningham, chairman and managing director, lays the foundation stone of an extension to the firm's premises at Stone on 8 January.

This extension, working in conjunction with existing premises at Stone, will substantially increase the output of the factory, already said to be the largest in the British Commonwealth producing industrial and laboratory chemical glassware.

The new factory will produce chemical plant including the world's largest glass pipeline, with a diameter of 18 inches. New annealing furnaces and specialised equipment will be features of the extension.

The Chemist's Bookshelf

HANDBUCH DER PRAPARATIVEN ANORGANISCHEN CHEMIE. Edited by Georg Brauer. Ferdinand Enke Verlag, Stuttgart. 1951. Part I. Pp. 160, Figs. 116. Dm. 21.

The work of which this is the first part promises to form a substantial and valuable contribution to the modern reference literature of inorganic chemistry. Most of the comprehensive treatises dealing with synthetic inorganic chemistry are wholly or partly out-of-date, whereas there is an increasing necessity for the ready availability of modern methods.

The summarised index for the complete work, included on the cover, shows that it is intended to have three main sections. The first deals with a wide variety of preparative methods, the second is concerned with elements and their compounds (and here it may be noted that the inert gases are missing from the list), the third is entitled Special Groups of Substances, and will include adsorbents and catalysts, hydroxy salts, iso- and heter-opoly acids, radioactive preparations, luminescent materials, carbonyls and nitrosyls, and intermetallic compounds.

As far as can be judged from the part already to hand, the work will fulfil its intentions admirably. Included here are the first section, on general preparative methods, which occupies 90 pages, and the first instalment of the second section—which, one would judge, would be the most extensive section of the completed work.

In Section I, by P. W. Schenk and G. Brauer, it is explained that no claim to comprehensiveness is made. Rather we are given a personal selection of methods. The authors have been at pains to include apparatus which, although not normal laboratory equipment, and originally devised for one specific procedure, may yet have a wider application; and to collect together a series of devices and dodges which, although almost in the traditional body of knowledge of the laboratory of their origin, are not yet to be found in the literature.

The scope of this section can best be gathered from a list of the more important topics; glass and ceramic materials; metals; pure liquids; lutings and greases; high, low and constant temperatures and temperature measurement; vacuum work; the handling of gases; liquefied gases as solvents; discharge tubes; purification of substances and the testing of purity; reactions in the solid state. This is a section which will prove of interest to a much wider circle of readers than those workers in synthetic inorganic work to whom it is specifically addressed. It is amply and clearly illustrated, and a number of references are appended. The clarity of the German, which is easy to translate, should make a particular appeal to British chemists. Indeed, the impression gained is that this would be an excellent book with which young chemists might practice their German translation.

The opening portion of the second section, which comprises the latter third of this part, is concerned with (1) hydrogen, deuterium and its compounds and water (M. Baudler), (2) hydrogen peroxide (M. Schmeisser), (3) fluorine and hydrogen fluoride (H. v. Wartenberg), and (4) fluorine compounds (W. Kwasnik). This last portion is obviously not complete. The three dozen compounds of fluorine whose syntheses are described are all compounds with non-metallic elements, and appear to follow the order of elements which is used for the main headings of Section II (and which broadly speaking, though not precisely, is that of Gmelin). If the deduction from this is correct, about 10 of the 29 groups of elements are represented by these 60-odd pages, so it may be presumed that about two-thirds of the sub-section on fluorine compounds is yet to come.

In addition to giving details of synthetic methods and a short list of properties, literature references are included with each synthesis. Directions appear to be precise and clear, and in some cases alternative methods of preparation are included.—C.L.W.

PERSONAL

The British Aluminium Co., Ltd., have announced that MR. W. H. PLATT, assistant sales manager (Wrought Products), retired on 31 December, 1951, after 41 years' service in the Sales Division. MR. C. F. BATSONE will combine the functions of principal assistant sales manager with those previously carried out by Mr. Platt.

SIR EDGAR SYLVESTER, chairman of the Gas Council, retired at his own request on 31 December. The deputy chairman, Colonel H. C. Smith, has been appointed to succeed him.

MR. H. O. SMITH, C.B.E., a joint personnel director of I.C.I., resigned from the board of the company on 31 December, 1951. Mr. Smith joined Bickford, Smith & Co., Ltd., in 1908 and became a director of the company in 1914. In 1928 he was appointed general manager and a delegate director of Kynoch, Ltd., and was chairman of the delegate board of I.C.I. Metals, Ltd., when in January, 1936, he became a director of I.C.I.

In 1940 Mr. Smith was seconded to the Ministry of Supply where he was Controller of Small Arms Ammunition and later Director-General of Ammunition Production. From March, 1945, Mr. Smith was director in charge of Group E (Explosives, subsequently Nobel) until July, 1951, when Groups D (Metals) and E were amalgamated. Since 1947 he has held the position of Personnel Director, in the first instance jointly with Mr. J. L. S. Steel, and subsequently with Dr. C. J. T. Cronshaw.

Monsanto Chemicals, Ltd., have announced that due to his business obligations in the U.S.A., MR. EDGAR MONSANTO QUEENY has regretfully found it necessary to resign from its board. Mr. Queeny is chairman of Monsanto Chemical Company, U.S.A., the parent company of Monsanto Chemicals, Ltd.

MR. L. A. LEWINTON, who has for some time acted as alternate director for Mr. Queeny on the board of Monsanto Chemicals, Ltd., has been appointed a director of the company.

Members of the staff of G. A. Harvey & Co. (London), Ltd., recently gathered to present tokens of their esteem and good wishes to Mr. Edward W. Taylor on his leaving the company's employment after completing 57 years' service.

Mr. P. Bliss, sales manager, in making the presentation on behalf of the staff, mentioned that Mr. Taylor commenced duties as an office boy in the accounts department at the age of 13½ years and for the princely wage of 5s. per week. Prior to his transfer to the sales staff in 1904, he was senior assistant in the accounts department.

Mr. Taylor's 'area' covered South East London as well as North Surrey and parts of Middlesex. This was later increased to take in West London and North Kent.

He was, however, after a few years, called back to take charge of the accounts department, where he stayed until 1920. After a further 17 years 'on the road', he returned to head office at the commencement of the last war.

Fisons, Ltd., announce that they have appointed DR. C. H. NOTON, M.Sc., Ph.D., as joint general manager of their subsidiary company Genatosan, Ltd. Mr. Noton took up his appointment on 1 January, 1952.

Obituary

Dr. H. F. Stockdale

The death has occurred at his home, Clairinch, Helensburgh, Dumbartonshire, of DR. H. F. STOCKDALE, LL.D., who was director of the Royal Technical College, Glasgow, from 1904 until his retirement in 1933. Dr. Stockdale was appointed secretary and treasurer of the college in 1899 at the age of 31. During Dr. Stockdale's directorship greater advantage than ever was taken of the opportunities provided for the teaching of science and its practical application to the industrial arts. When he received the degree of Doctor of Laws from Glasgow University in 1919 he was described as 'the model director of a model college of Applied Science'.

Publications & Announcements

ACETYL peroxide is a versatile reagent, useful where free radicals are desired, but hazardous to isolate because the slightest mechanical disturbance is sufficient to detonate the crystals, resulting in serious accidents. A new data sheet has just been issued by the Buffalo Electro-Chemical Company which describes a relatively safe way to isolate acetyl peroxide in almost pure form from the commercially available solution in dimethyl phthalate. This bulletin, Number 28, is available (gratis) upon written request to the BECCO Sales Corporation, Station B, Buffalo 7, New York.

* * *

PROFUSELY illustrated and telling the story of the manufacture of expanded metal and its uses in considerable detail, the new Expanded Metal Catalogue just issued by Pen Metal Company, Inc., 205 East 42nd Street, New York, is most useful for anyone concerned with the use and fabrication of metal and metal products. This booklet shows a great many examples of uses for this product and suggests many others. Emphasis is placed on the advantages of expanded metal in saving steel and other critical metals while at the same time accomplishing the purposes of providing saving in weight, allowing for free passage of light and air, and permitting flexibility of construction.

* * *

PRESENT-DAY costs of plant and equipment replacement lend added point to a survey of the chemical-resistant properties of a number of metals which appears in the winter issue of *Building Topics,* house journal of Tretol Ltd. The frequent use of chemicals in modern manufacturing processes demands extreme care in the selection of metals used for processing and storage plant and this article provides some valuable data on the effects of many commonly used chemicals on a wide range of metals.

Also featured in this issue is the first of two articles dealing with the correct construction of concrete floors. Careful selection of aggregate and proportions in the mix are stressed and the problems of chemical attack considered, together with suggested measures for ensuring increased durability of floors.

The final article in this issue deals fully with spray painting and application technique, with a chapter devoted to possible defects and practical remedies.

Copies of this attractive publication can be obtained free of charge from Tretol Ltd., 12-14 North End Road, London, N.W.11.

* * *

HANOVIA, Ltd., of Slough, Bucks., announce the production of an instrument for the fluorescent examination of chromatograms, called the 'Chromatolite'. It is a portable unit, and has as a source a low-pressure mercury resonance tube which generates over 80 per cent of its output at the wavelength of 2,537 Å. For the location of purines and pyrimidines, this band detects spots which are invisible under long-wave fluorescence. The tube is 2 ft. long in an elongated U-form, both terminals being contained in a standard valve connection. The tube and housing are separable and attached to the control unit. The whole unit is so shaped and balanced that the fluorescent source can be directed at any angle, either vertically or horizontally. When used over the bench surface it has a clearance of $3\frac{1}{2}$ in. throughout its length. The unit weighs $13\frac{3}{4}$ lb., works in the 200/250 volt range (50-60 cycles) with other voltages and frequencies to special order.

* * *

THE chemical and physical apparatus makers, Janke & Kunkel, K.G., Staufen i/Br., are producing and marketing a recently patented mixer, IKA Ultra-Turax, which serves as a dispersing and emulsion apparatus for laboratory use and industrial operation. It works at very high speeds, it is said, and can be used in the manufacture of chemicals, medicines, cosmetics, tooth pastes, polishes, insecticidal sprays, oil-bound distempers, lubricants, road sprays, sizing materials, etc. It allows mechanical mixing by means of an emulsifier of the homogeniser or colloid mill type in the presence of a stabilising, emulsifying agent which is adsorbed at the emulsion interference. A representative of the firm intends visiting the U.K. in the near future to demonstrate to interested circles the various models of the apparatus and its best manipulation.

Company News

Powell Duffryn, Ltd.

Powell Duffryn, Ltd., have announced the following dividend:—Interim dividend of 3 per cent actual, less income tax at 9s. 6d. in the £, on the £9,660,471 Ordinary Stock in respect of the year ending 31 March, 1952. Payment to be made on 23 February, 1952, to holders registered on the books of the company at close of business on 31 December, 1951. Transfer books to be closed for one day on 1 January, 1952.

British Oxygen Engineering

The British Oxygen Company announces the formation of a wholly-owned subsidiary, British Oxygen Engineering, with an authorised capital of £2,000,000. Under the new arrangement, which is purely for internal reasons, the engineering works at Edmonton will be owned by the new subsidiary. This has been decided upon because the activities of these works are of a rather different type from the main business of the group.

Nordac, Ltd.

For some years Nordac Limited, chemical engineers, has been responsible for the management of S. Porter & Co., Ltd., chemical plumbers, and it has now been decided to merge the latter firm into the Nordac organisation as a separate department. By eliminating the unavoidable overhead expense necesssary in the administration of a separate company, it is hoped to provide a means of combating the increasing cost of materials and labour and maintaining the present level of prices for lead work undertaken. Transfer of the lead business to the Uxbridge works of Nordac Limited was completed on 20 December last.

Bristol and West Tar Distillers, Ltd.

Incorporation of the Bristol and West Tar Distillers, Ltd., was announced on 20 December. The new company is a wholly-owned subsidiary of Wm. Butler & Co. (Bristol), Ltd., with a nominal capital of £100. The first directors are: Thomas Howard Butler, Eric Wakefield Butler, Eric Peter Butler and Thomas Cyril Gwyer Butler. The company will acquire and operate all the tar and distilling interests of the parent firm (as from 1 January), and the capital will, in due course, be increased to a sum commensurate with its trading and with the assets involved. This division of operations of the parent company was found necessary owing to the ever-increasing activities in the tar distilling business, both on the sales and technical side, and also to ease the administration.

Chemical Engineering Wilton's, Ltd.

The Chemical Engineering & Wilton's Patent Furnaces, Ltd., announces that it has shortened its title and will in future be known as: Chemical Engineering Wilton's, Ltd., Holbrook Park, Horsham, Sussex. In other respects the constitution of the company remains unchanged.

New Registrations

Society of Leather Trades' Chemists, Ltd.

(502,705). To assist and encourage the application of science to the manufacture and utilisation of leather and related products, etc. The income and property of the society shall be applied solely towards the promotion of its objects. The management is vested in a Council, the first members of which are: G. J. Cutbush (president), W. E. Palmer (vice-president), D. Burton (treasurer), G. H. W. Humphreys, A. Cheshire, P. Danby, G. Forsyth, J. R. Furlong, R. E. Hunnam, and R. G. Mitton. Solicitors: Peacock & Goddard, 6 Aldford Street, Park Lane, W.1.

Reichhold Chemicals, Ltd.

Private company. (502,700). Capital £100. Financiers and manufacturers and merchants in chemicals, paints and synthetic resins, etc. Subscribers: Miss A. E. Price and D. C. Drake. Solicitors: Biddle Thorne & Co., 1 Gresham Street, E.C.2.

British Oxygen Engineering, Ltd.

Private company. (502,669). Capital £2,000,000. To acquire the manufacturing and trading business carried on by the British Oxygen Co., Ltd., at Angel Road, Edmonton, N., and to carry on the business of mechanical, electrical, consulting, civil and general engineers, etc. Directors: J. S. Hutchison, W. W. Watt, J. R. Park, F. J. Clark, L. S. Kinnear, F. C. S. Lewin, Lewin-Harris and M Seaman. Reg. office: Bridgewater House, Cleveland Row, St. James', S.W.1.

Electric fork truck with hydraulic squeeze clamp attachment

Next Week's Events

MONDAY 7 JANUARY

Pharmaceutical Society of Great Britain

London: 17 Bloomsbury Square, W.C.1, 7.30 p.m. F. Hartley: 'The Nomenclature of Drugs.'

TUESDAY 8 JANUARY

Institution of Chemical Engineers

London: Geological Society, Burlington House, W.1, 5.30 p.m. C. J. Stairmand: 'The Design and Performance of Cyclone Separators.'

Incorporated Plant Engineers

Edinburgh: 25 Charlotte Square, 7 p.m. Dr. H. Buckley: 'Organisation of Scientific Research in Great Britain.'

WEDNESDAY 9 JANUARY

Microbiology Group (SCI)

London: Lecture Hall, Institution of Structural Engineers, 11 Upper Belgrave Street, S.W.1. Symposium on Disinfectants. Speakers include Professor H. Berry, Dr. P. Maurice, Dr. L. A. Allen, Mr. J. C. L. Resuggan and Dr. S. E. Jacobs. (Jointly with Society of Applied Bacteriology).

Manchester Metallurgical Society

Manchester: Engineers' Club, Albert Square, 6.30 p.m. J. E. Hurst: 'Cast Iron.'

THURSDAY 10 JANUARY

The Chemical Society

Bangor: Department of Chemistry, University College of North Wales, 5.45 p.m. Professor Alexander Robertson: 'Mould Metabolic Products.'

Institute of Fuel

Liverpool: Radiant House, Bold Street, 2.30 p.m. Dr. A. C. Monkhouse: 'Progress in Domestic Heating Research.'

The Fertiliser Society

London: Tudor Room, Caxton Hall, Caxton Street, Victoria Street, S.W.1. J. H. Hamence and R. Donald: 'Recent Advances in NPK Chemical Analysis.'

Incorporated Plant Engineers

Maidstone: Queen's Head Hotel, 7 p.m. G. Clifton: 'Automatic Combustion Control as Applicable to Industrial Type Boilers.'

FRIDAY 11 JANUARY

The Chemical Society

St. Andrews: Chemistry Department, United College, 5.15 p.m. Dr. G. R. Tristram: 'Isotopes in Biological Research.'

OCCA

Manchester: Grand Hotel, 2.30 p.m. Dr. A. Buraway: 'Some Aspects of the Chemistry of Azo Colours.'

Society of Glass Technology

St. Helens: Gas Showrooms, Radiant House, 6 p.m. J. F. Stirling: 'Practical Aspects of Annealing.'

Liverpool Metallurgical Society

Liverpool: Lecture Theatre, Electricity Service Centre, Whitechapel, 7 p.m. H. M. Finniston: 'The Use of Radioactive Tracers in Metallurgical Research.'

Market Reports

LONDON.—Active trading conditions have returned to most sections of the industrial chemical market, but there is some hesitancy in the demand from the bleaching and finishing trades. There have been no important price increases to add to those reported last week, although higher rates are expected to come into operation for a number of items when the full effect of the increases in fuel and transport costs is felt. The position of the coal tar products is unchanged with prices steady on a firm undertone.

MANCHESTER.—The Manchester market for textile and other heavy chemical products during the past week has not fully recovered from the seasonal quietness inseparable from the Christmas and New Year holidays and traders are not anticipating a full resumption of activity until next week at the earliest. They are concerned about the outlook for the wide range of products which find an outlet in the bleaching, dyeing and finishing trades in view of the setback now being experienced in the textile industry. If this continues the demand from this direction cannot but be seriously affected.

Bitumen Prices Raised

Shell-Mex and B.P. announces an increase of 12s. 6d. and 32s. 6d. a ton respectively in the bulk and packed prices of all grades of Mexphalte, incorporating penetration bitumens, oxidised bitumens and hard bitumens, and of ¼d. a gallon in all prices of Shelphat with effect from 1 January, 1952.

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

UNIVERSITY OF LONDON. A course of three lectures will be delivered by Professor J. Cathala (Toulouse), at 5.30 p.m., on January 16th, 17th and 18th, at University College (Anatomy Theatre), Gower Street ,W.C.1. January 16th : " Unit Chemical Operations in Chemical Engineering." January 17th : " Principles of Design of Adiabetic Converters for Heterogeneous Reactions." January 18th : " Principles of Design of Pseudo-Isothermal Converters for Heterogeneous Reactions." **ADMISSION FREE, WITHOUT TICKET.**

JAMES HENDERSON,
ACADEMIC REGISTRAR.

SITUATIONS VACANT

APPLICATIONS are invited by the Ministry of Supply for vacancies in the Experimental Officer Class at the **ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL, BERKS,** for work in the following fields: Physics, Electronics and Scientific Computing (Ref. A309/51/A), and Chemistry (other than Organic Chemistry), Chemical Engineering and Metallurgy (Ref. F777/51/A).

These posts offer a wide variety of experimental work in connection with the development of Atomic Energy and the opportunity for a career in an increasingly important branch of Science. Candidates should possess at least Higher School Certificate or Higher National Certificate in a relevant scientific subject or Mathematics or equivalent qualifications. Higher qualifications will be an advantage. Appointments will be made according to qualifications, experience and age within the following salary ranges :—

Experimental Officer (male) : £545-£695 per annum.
Assistant Experimental Officer (male) : £240 (at age 18)-£505 per annum.
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